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ABSTRACT

This document contains the papers on preservice teacher education from the SITE (Society for Information Technology & Teacher Education) 2002 conference. Topics covered include: examples of models of teacher development for technology integration from the SITE 2001 proceedings; Portuguese student teachers' experiences regarding use of the Internet; technology lesson plans for the elementary methods class; establishing a minor in information technology for preservice education; perceptions of technology in preservice education courses; a performance based assessment of instructional technology competencies; infusion of technology throughout a teacher licensure program; teacher roles as a framework to embed technology in teaching; problem-based learning to prepare students for technology leadership; online lesson plan collaboration; NASA (National Aeronautics and Space Administration) partnership opportunities; poetic conventions and teachers' relationships with technology; the cognitive apprenticeship model and preparing preservice teachers to plan for technology use; authentic assessment; technology and constructivism; the teaching observatory concept; online learning environments; design of a faculty development model; computer-based modules for preservice teacher education; preservice teachers and multimedia design; electronic models to increase preservice teachers confidence for technology integration; distributed learners; a Web-based solution for integrating technology into teacher education courses; developing video case studies; development of CD-ROM course materials; intergenerational learning; creating a virtual classroom; grant writing using computer technology; coding electronic discussion to promote critical thinking; partnering of students with teachers and administrators for technology implementation; the e-Campus; developing reflective practices through a Web-based electronic teaching portfolio and video-on-demand assessment program; a team approach to preparing preservice teachers to use technology; online learning and mentors; a classroom discipline problem solving environment; integrating technology to enhance performance assessment; WebQuest collaboration for special needs awareness; teachers' purposes for using the Internet; Web design and service learning for classroom change; meeting educational technology standards for teachers; multimedia and multiple intelligences; simulations and constructivist

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strategies in an educational technology course; an electronic reserve system; and portfolio assessment. Several brief summaries of conference presentations are also included. Most papers contain references. (MES)

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# Preservice Teacher Education
# (SITE 2002 Section)

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# PRESERVICE TEACHER EDUCATION

# Models of Teacher Development for ICTs Integration: Examples from the 2001 SITE Proceedings

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**Abstract**: This paper identifies papers from the 2001 SITE conference which may serve as examples of strategies described in a forthcoming report on Models of Teacher Development for the Integration of ICTs in the Classroom. It provides convenient means of amplifying understanding of the models and obtaining guidance for future implementation. In addition it makes recommendations for presentation of future work in the field.

## Background

The need to prepare teachers for integrating Information and Communications Technologies (ICTs) is widely recognized and much can be learned from considering various initiatives already undertaken around the world. It was in that context that Professional Group 5.2 met at the IFIP World Conference on Computers in Education 2001 in Copenhagen, to consider the topic, *Models of Teacher Development for the Integration of ICTs in the Classroom.* A report of those discussions will be published early in 2002 (Downes et al., 2002).

A key task undertaken by PG 5.2 was to identify models of teacher development for ICTs integration in pre-service teacher education and continuing professional development programs. For those charged with preparing teachers to integrate ICTs, the value of the list of models would be increased if they could easily locate examples of the models in use. Tables listing the models in the report are supplemented by illustrative examples, but space did not permit a comprehensive list of examples. Hence there is a need for a more extensive list of examples.

The annual conference of the Society for Information Technology in Teacher Education (SITE) is a large meeting with a focus on ICTs in teacher education. Although the majority of participants at SITE are from the USA, there is a significant and growing international attendance. Many of the hundreds of presentations at SITE conferences report on practices for preparing teachers to integrate ICTs. Hence, the SITE proceedings should be a rich source from which examples of the PG 5.2 models might be identified. This study sought to examine the proceedings of the 2001 SITE conference (Price, Willis, Davis, & Willis, 2001) with a view to assessing whether they include examples of the pre-service teacher education models listed in the PG 5.2 report (Downes et al., 2002).

## Method and Results

The 2001 SITE Proceedings (Price et al., 2001) totaled 3175 pages comprising over 700 papers and were published on CD-ROM as PDF files. Searches of the full text of the proceedings were conducted using the search facility in Adobe Acrobat Reader with search terms selected from the proposed models (Downes et al., 2002) and, where such terms proved unsuccessful, selected synonyms. As terms were located, the papers were scanned for relevance and, where appropriate, noted for closer examination. In selecting papers for consideration, preference was given to those that included a thorough description of practices corresponding to the models. Table 1 matches papers with models. To conserve space, the papers are identified using the first author and page number from the SITE proceedings.

On examining the selected papers, it was evident that programs commonly included multiple models and the list of papers was progressively reduced to form a minimal set of 11 papers that included all 15 models. There is no implication that the papers identified herein are the best or only papers that exemplify particular models listed in the

PG 5.2 report. Some models were notably less common and the papers identified for some had little useful detail. For example, online collaboration with students in schools was the subject of a roundtable at the conference (Goldman 2965) but, although it is mentioned in a section summary, there is no paper in the proceedings.

| | Models for pre-service teacher development in ICT integration (Downes et al., 2002) | Abate 1823 | Becket 1858 | Bennet 2969 | Espinoza 408 | Goldman 2965 | Heyns 58 | Hung 879 | McCaughey 708 | Regan 1716 | Rubio 1746 | Schmidt 2080 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | Separate compulsory ICT subjects-skill acquisition | | | | X | | | | | | | |
| B | Separate compulsory ICT subjects-curriculum/pedagogy | | | | X | | | | | | X | |
| C | Diffusion-modeling and use across course (with integration across various subjects) | X | | | | | | | X | | X | |
| D | ICT Electives-skill acquisition | | | | | | | X | | | | |
| E | ICT Electives-curriculum/pedagogy | | | | | | | | | | | X |
| F | Face-to-face use with children expected as part of learning experience or assessment tasks within particular subjects | | | | X | | | | | | X | |
| G | Online use with children expected as part of learning experience or assessment tasks within particular subjects | | | X | | | | | | | | |
| H | Planning, teaching and evaluation of use of ICTs for learning expected as part of professional experience requirement | | | X | X | | | | | | X | |
| I | Modeling by classroom teacher expected as part of professional experience | X | | | | | | | | | | |
| J | Online collaborative/team interactions with students in schools for projects/learning-virtual practicums | | | | | X | | | | | | |
| K | Online interactions with teachers/professional communities as part of core learning experiences | | X | | | | | | | | | |
| L | Partnerships with schools so that student teachers, classroom teachers and teacher educators engage in inquiry or development projects around the use of ICTs for teaching and learning | | X | | | | | | | | | X |
| M | Faculty professional development | X | | | | | | | X | | | |
| N | Flexible delivery, student-centered approaches to teaching and learning | | | | | | | | | X | | |
| O | Partnerships with industry: curriculum/software development programs | | | | | | X | | | | | |

**Table 1:** Models of preparation for ICT integration in pre-service teacher education (Downes et al., 2002)

## Conclusions

Based on the contents of Table 1, it seems fair to conclude that the 2001 SITE proceedings include all of the models identified by PG 5.2 for pre-service preparation of teachers for integrating ICTs. However, it seems that many teacher education programs use combinations of the models, presumably because they offer different benefits.

The search for papers matching the PG 5.2 models was sometimes hampered by differences in terminology. For example, PG 5.2 used "professional experience" in reference to pre-service teachers but the only use found in the SITE proceedings was to the experience of professionals. The nearest equivalent appeared to be "field experience". Such instances suggest that the usefulness of the SITE proceedings would be enhanced by the adoption of an agreed vocabulary of keywords. Such an addition would be worthy of consideration for future SITE conferences.

This initial review of one conference community's proceedings is part of a wider ranging review of examples to support the report, *Models of Teacher Development for the Integration of ICTs in the Classroom.* This will inform and raise issues for future evaluations of the experiences of teacher development with ICT.

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Price, J., Willis, D., Davis, N., & Willis, J. (2001). *Proceedings of SITE 2001*, [CD ROM]. Association for the Advancement of Computing in Education.

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# Portuguese Student Teachers' Experiences, Perspectives and Expectations Regarding the Use of the Internet: The Impact of a Preservice Program.

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**Abstract**: This paper reports on one specific Portuguese university's student teachers' opinions, experiences, perspectives and expectations regarding Internet usage. Data was collected using a questionnaire which was anonymously answered by 189 student teachers from 9 different preservice programs. Some differences were found between males and females and between the diverse program groups concerning opinions about the Internet and how they use it and expect to use it in the future. Some reflections are made about the effectiveness of our students' technological preparation.

## Introduction

The growth of the new information technologies and their spreading uses in education have been enormous. Educators' concern with mathematics teacher education (Grouws and Schultz, 1996) along with the increasing availability of both virtual information and modes of communication (Hughes and Hewson, 1998) led us to rethink mathematics teachers' pre-service education. Furthermore, as collaborative work (Wallace, Cederberg and Allen, 1994) as well as the use of technology (Balacheff and Kaput, 1996) have long become two of the focuses of the recommendations for mathematics teachers preparation and professional development, we cannot but envision its context within a framework of new information technologies. The avalanche of available resources on the Internet as well as one's access to it, is rapidly changing both one's views of a worldwide community and one's conceptions of Internet usage (Schrum and Lamb, 1997).

Making changes and breaking barriers require courage and creativity. This seems particularly true for the people responsible for teacher's in-service and pre-service education. The Internet seems to be the answer to the problem of finding and giving information, because it is easy and fast. However the large amount of available information brings new demands on the teachers for whom being able to select what is relevant becomes critical. Therefore the intervening agents in the teacher education process must contribute to open up perspectives so that students take advantage of all the information that is available, both in their lives and in their careers. In Portugal there has been research on the Internet usage in the context of both the mathematics classroom (Morais et al., 1999; Almeida et al., 2000; Ponte et al., 2001) and the professional development of teachers of mathematics (Ponte et al., 2001; Ponte, 2000; Miranda et al., 2001; Almeida et al., 2001; Almeida et al., 1999). However more has to be known about our students' Internet experiences and how they may influence their perspectives and expectations. Only with this knowledge may we seek further action into creating new learning communities as well as helping our prospective teachers to fully integrate them.

In this paper we will talk about one specific Portuguese university's student-teachers' experiences, perspectives and expectations on Internet usage.

## Sample and Data Collection

Our data stem from a questionnaire for which there were 189 anonymous responses from our 2000/2001 academic year 360 entire student-teachers population. The sample's ages range from 22 to 44 with mean 24.74, mode and median both 23, and the third quartile 25. There were 159 females and 30 males distributed by a total of 9 pre-service education programs. Only 29 of the respondents reported having had previous teaching experience. From a total of 181 who reported having a computer at home, 92 say that they are connected to the Internet. Most schools where the student teachers do their teaching practice have computers and Internet which can both be used by teachers and students. Table 1 shows the distribution of students by pre-service programs and sex. There is 1 missing answer from a female student.

| Pre-service Education Programs | Females |  | Males |  | Total |  |
|---|---|---|---|---|---|---|
|  | n | % | n | % | n | % |
| Biology and Geology | 18 | 11.4 | 1 | 3.3 | 19 | 10.1 |
| English and German | 18 | 11.4 | 1 | 3.3 | 19 | 10.1 |
| History | 11 | 7.0 | 4 | 13.03 | 15 | 8.0 |
| Mathematics | 40 | 25.3 | 12 | 40.0 | 52 | 27.7 |
| Physics and Chemistry | 20 | 12.7 | 7 | 23.3 | 27 | 14.4 |
| Portuguese | 10 | 6.3 | 1 | 3.3 | 11 | 5.9 |
| Portuguese and English | 22 | 13.9 | 1 | 3.3 | 23 | 12.2 |
| Portuguese and French | 8 | 5.1 | 1 | 3.3 | 9 | 4.8 |
| Portuguese and German | 11 | 7.0 | 2 | 6.7 | 13 | 6.9 |
| Total | 158* | 100 | 30 | 100 | 188 | 100 |

**Table 1**: Distribution of student teachers by pre-service programs and sex

During their 5-year pre-service education programs all prospective teachers have the same general education courses, along with courses specific to each program: *History and Philosophy of Education* in 1st year; *Psychology of Education* and *Pedagogical Practicum I* (*Teacher-pupil interaction analysis*) in 2nd year; *Educational Sociology, Curriculum Development and Teaching* Models and Pedagogical *Practicum II (Technology)* in 3rd year; *School Organization and Administration* in 4th year. As far as technology preparation is concerned, only the Mathematics and the Physics/Chemistry students have more than just the *Pedagogical Practicum II (Technology)*: Physics and Chemistry students also have an *Introduction to Informatics* course in their 1st year; the Mathematics Education students have an *Introduction to Programming* course in 1st year and *Informatics in Teaching* in 4th year. In their 4th year all students have a didactics course specific to their area.

## What student teachers think and feel about the Internet

The student teachers answered a nine-item semantic questionnaire. In each item they were to indicate, on a five-point scale, their inclination (or neutrality) towards one of two opposite adjectives. For analysis purposes, items were code so that in each of them 1 is the most negative opinion and 5 the most positive opinion. Table 2 summarizes the results for the entire sample.

| The Internet is | N | Min. | Max. | Mode | Median | Mean | Std. Dev. |
|---|---|---|---|---|---|---|---|
| Boring -- Fun | 185 | 2 | 5 | 4 | 4.00 | 4.01 | .75 |
| Hard -- Easy | 184 | 1 | 5 | 4 | 4.00 | 3.53 | .97 |
| Useless -- Useful | 185 | 1 | 5 | 5 | 5.00 | 4.52 | .79 |
| Uninteresting --Interesting | 186 | 1 | 5 | 5 | 5.00 | 4.39 | .75 |
| Complex -- Simple | 184 | 1 | 5 | 3 | 3.00 | 3.33 | 1.00 |
| Unimportant -- Important | 184 | 2 | 5 | 4 | 4.00 | 4.14 | .71 |
| Harmful -- Beneficial | 184 | 2 | 5 | 4 | 4.00 | 4.12 | .75 |
| Discouraging -- Motivating | 185 | 1 | 5 | 4 | 4.00 | 4.02 | .84 |
| Confusing -- Clear | 183 | 1 | 5 | 4 | 3.00 | 3.37 | .95 |

**Table 2**: Summary of all student teachers answers to the semantic questionnaire

It can be seen that, in general, student teachers characterize positively the Internet in all items considered.

### Differences between males and females

Lack of homogeneity of variance (found by Levene's statistics) induced us to use chi-square tests to find differences between males and females in each of the 9 items of the semantic questionnaire. However care must be taken as there were cells with expected values less than 5. Males and Females generally agree that the Internet is useful, interesting, important, beneficial and motivating. But males seem to find it funnier, easier, simpler, and clearer than their female counterparts do. Figure 1 shows differences between males and females.

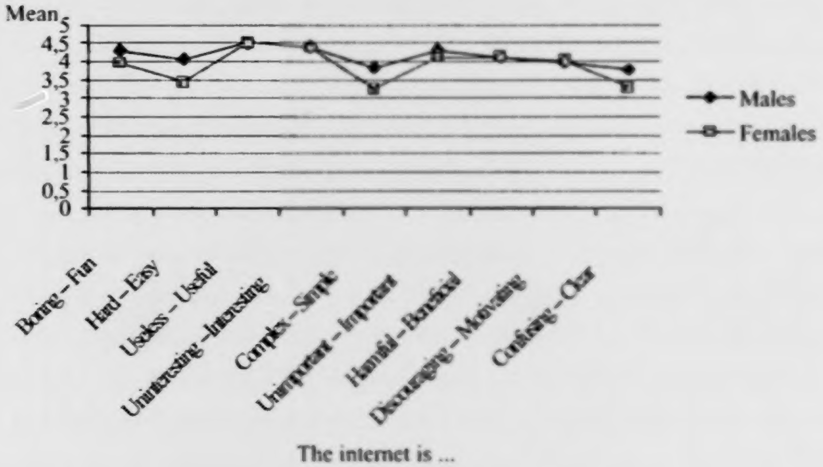

**Figure 1: Differences between males and females**

Further investigation into this matter shows that, when asked to indicate simple words to describe advantages, disadvantages and difficulties, females' answers are more consistent than those of males. Furthermore they refer more frequently to the ease of access to information and of communication as advantages of the Internet, while being costly (not being for everybody) and giving access to obscene information are indicated as disadvantages. Too much information, assessing/selecting the right information not being so easy, lack of information in Portuguese, and technical issues (like software installation and working with chat and e-mail) were the difficulties most referred specially by females. As far as these female-male differences are concerned we hypothesize that causes may be socially bound.

### Differences between education program groups of student teachers

For the semantic questionnaire and the education programs it was found that the degree of heterogeneity was not significant in any of the cells at the .05 level. Therefore a one-way analysis of variance was used to find whether student teachers from different programs had different views of the Internet regarding the nine items of the semantic questionnaire. There were significant differences only in the *Complex – Simple* (F=3.499, p<0.001), and *Confusing – Clear* (F= 2.365, p<.019) items. Some differences were also observed in item *Hard – Easy*, although significance was not clear (F=1.799, p<0.80). Figure 2 shows the means plots for these three items.

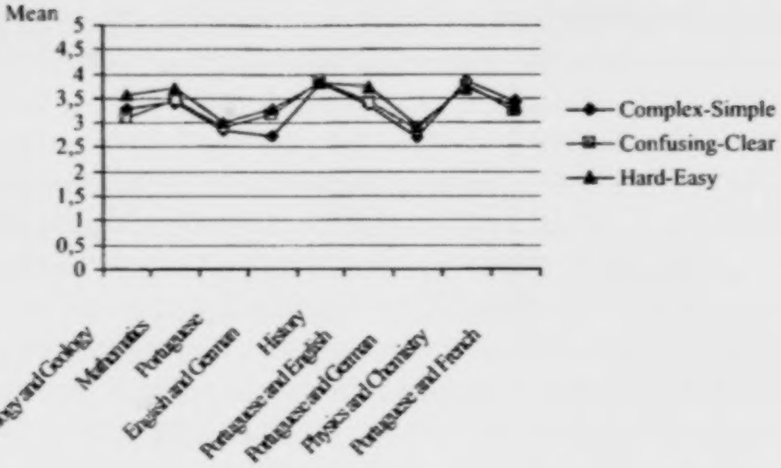

**Figure 2**: Means plots for the Hard – Easy, Complex – Simple and Confusing – Clear items

## Internet usage by student teachers: perspectives and expectations

From the other items of our questionnaire we can see that these student teachers' global usage of the Internet seems to have increased from the 1st to the 5th year. One factor which cannot be ignored is the growth of computer and Internet facilities in our campus. More and more the Internet is being used as a means of communication even at the official level. Students now also have to enroll for the exams on the university web page.

In their answers to the questionnaire most student teachers reported never having used the Internet to chat, to construct a WWW page, to communicate with colleagues from other schools. Most also admitted having seldom discussed with their colleagues about Internet applications in teaching. Most also denied ever having used the Internet in someway by suggestion or requirement from the part of their school or university supervisors. In general it seems that the Internet was not a very frequent presence in the student teachers' lives. However they expressed the idea that in the future they will frequently use the Internet: mostly to search for bibliography and for information about their field of work, and to find ideas for their teaching. They also think that they may quite often show things from the Internet and suggest sites to their students. It is revealing that the Internet is not yet used by student teachers as a potentially fast and efficient means of communication, but that they expect to use it in their future professional lives. However to construct web pages does not seem to be in their future perspectives.

## Conclusions

From our investigation we can infer that in general the university's student teachers have high expectations and quite favorable opinions about their Internet future usage. It can be seen from our data that a high percentage of students with a computer at home are connected to the Internet. However they report a very limited actual use of the Internet as a means of communication and interaction in their academic activities.

Surprisingly for us mathematics educators, this is also true for our mathematics student teachers. Considering the contents of the mathematics education program, we would expect the mathematics student teachers to be better acquainted and to feel more comfortable with computers and particularly with the Internet. Therefore we should reflect on the weak effect technology courses seem to have on students and on what the causes of found differences may be. Also we should not forget that there is a longer history of computer usage in mathematics education than in any other field. This fact had previously led us to expect that the mathematics student teachers would feel more at ease with computers and with the Internet than students from other programs. But such does not seem to happen. Why? Might there be too much pressure on the mathematics students teachers? Knowing mathematics, knowing about calculators and about computers, dealing with kids' negative attitudes towards mathematics in their teaching practice, and a lot more, all seem to take too much time and energy to leave any room for new cyber discoveries. Might there be also a reflection of faculties' own ideas and expectations about the Internet? These are questions that we cannot answer now.

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# Technology Lesson Plans for the Elementary Methods Class

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**Abstract:** Written Lesson Plans with the National Educational Technology Standards: Professors, Pre-service Teachers, and K-6 Teachers Worked Together to Perfect Lessons that Work in Schools with Children from Ethnically Diverse Backgrounds Technology enhanced K-6 lessons are now available, "hot off the press," at this session. They are engaging, creative, focus on critical thinking, and contribute new knowledge to the field of technology in teacher education. Eight subject area teams spent a year using technology in their classrooms. The teams included Reading/Language Arts, Math, Science, Social Studies, English as a Second Language, Exceptional Student Education, Curriculum, and General Methods. After a year of research in the field of technology in the classroom, the team members began to write content area lessons based on the National Educational Technology Standards. Selected pre-service teachers and professors cooperatively wrote the lessons. The lessons were sent through an outside peer review process. K-6 teachers in several public and private schools in South Florida field-tested the lessons. Tried and true, these lessons will spark your interest in using technology in teacher education.

## History of the Project

The main goal was to infuse technology into all aspects of pre-service teacher education training. We have set out to accomplish this by professional development and team accountability. Each of the eight teams was assembled with pre-service teachers, professors, and K-6 teachers. They have received at least 50 hours of professional development related to technology in their subject area. They have also been working together in their on line team area to reflect on the practical use of technology in their classes. The number of postings per group were tabulated and viewed over time. The actual postings for each group are included as documentation of the thoughtful reflection that each team has participated in.

**On-Line Presence**

Information about our project may be viewed at: http://garnet.fgcu.edu To view these discussions, one may register for the PT3 Fall and/or spring courses and create an identity. Once this is done, posting will be enabled for the viewer. Our website also contains information that documents our workshop activities with our partners. Our website is located at: http://coe.fgcu.edu/PT3/home.htm.

**Interdisciplinary Partnerships**

We have fostered relationships among other departments by recruiting professors from other disciplines to be participants on the subject area teams. We began with professors from Communication, Guidance and Counseling, Math, Science, and English. Several of the professors we originally recruited have resigned due to the differences between their professional fields and teacher education at the elementary level. We have, however, retained a few professors from other departments.

**K-6 Teachers Relate with Professors and Pre-Service Teachers**

We have addressed the need for collaboration with K-12 teachers by placing eighteen K-6 teachers from five elementary schools on the subject area teams. This has been an essential part of our project as professors and pre-service teachers relate with classroom teachers on a regular basis. Four of these K-12 teachers serve as team leaders.

**Journey to Technology Integration and Meaningful On-Line Communication**

We began the project in early fall. We scheduled two orientations, one at STU and one at FGCU so that all participants would know what they were required to do for the year. It was presented, but after a few weeks it was apparent that some of the participants were not posting weekly in their on-line team areas as they were supposed to. Because we had two separate orientations, many of the team members never did get a chance to meet. In order to get the participants to post in their team area, we first tried sending them many reminders. That worked with some people, but not all.

Another problem we had was that the reflective postings were not quality postings. Some team members would cut and paste information from other sources or just refer the team to a website without any reflection on how that site could be used in their classroom. In order to get some quality control, we defined what we believed to be a "substantive posting." We told the participants that it was: "A substantive posting requires content that reflects participant's actual understanding or use of technology in the classroom. This awareness grows out of the participant's direct experiences with the literature, professional development experiences, personal experience, or direct responses to other substantive postings."

After this, the quality of the postings improved significantly. We also changed the weekly posting requirement to 14 substantive postings per semester. This enabled the participants to "catch up" if they were behind. It quantified our requirements. Our next step was to issue contracts to all our participants, which we should have done at the outset.

Another barrier was the distance between STU and FGCU. One is on the east coast of Florida and one is on the west coast. During the second semester, we initiated team leader on-line chats. Those chats were helpful in bringing the team leaders together. Individual teams also decided to have on-line chats. We also had a team leader meeting in person. It was the best thing for us. We were all able to talk about our goals for next year and come to an agreement on the contracts we will offer the participants year 2. Team leaders will meet monthly next year, alternating between on-line chats and in person meetings. All the participants will meet together at the beginning of year 2. There was resistance to bringing all the parties together from FGCU, but it is needed and will be done.

## Reflections from K-6 Teachers: Carol Wilson and Paula Sanders

I. "Do-able" Lessons for Elementary School Teachers
  A. How to Start a Lesson?(Activity Vs. Lesson)
  B. How to Create a Good Lesson Plan?
  C. How to Evaluate a Lesson?
  D. Where to Get Lesson Ideas?

II. Time Involvement and Equipment Issues-The Real Story! (Personal experiences)

III. BEACON Web Site overview with ISTE standards inserted; other sites, which contain quality lesson plans (Internet access and projector required)

IV. Examples of Teacher Created Lessons (provided by presenters)

V. Eye Openers that the Pt3 Experience brought to the classroom educators attention. (Personal experiences)

## National Educational Technology Standard-Based Lesson Plans Are Written

The technology enhanced lesson plans for the Fall 2001 Semester are written and can be viewed on the BEACON database. The website for BEACON is www.beaconlc.org Selected lessons will be shown at this session.

# ESTABLISHING A MINOR IN INFORMATION TECHNOLOGY FOR PRESERVICE EDUCATION

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**Abstract**: Increasing reliance on computers for teaching and learning places many additional demands on providers of preservice education. For small schools the challenges are particularly daunting. This paper briefly describes how a minor in information technology was conceptualized and offered. The minor has a strong hands-on focus, is flexible in sequencing, and allows students to choose where and when they take IT courses. In a very brief span of three years this minor has become very popular and appears to provide the educational and professional needs of a growing population of education majors.

The growing reliance on computers for both teaching and learning in the classroom has challenged the training of preservice education providers. A hotly debated issue on campuses today is what specific kinds of training in the field of information technology (IT) do preservice student's need?

Almost every institution and individual engaged in preparing teachers has asked questions about how to train adequately in a rapidly changing IT environment. For smaller schools, in particular, providing IT training to preservice students has been a significant challenge. This paper describes some major issues that arise and presents the outcomes of the introduction of a new program called he minor in information technology.

Since 1919 Emmanuel College, a Catholic institution in Boston, has prepared pre and post-service teachers for positions in suburban and city schools. Students are given a strong theoretical base in the liberal arts upon which their practicum experiences are built. This helps students develop those skills necessary to manage a sound, organized, and creative learning environment. Preservice undergraduate students are encouraged to develop a philosophy of education uniquely their own. At the same time students need a strong foundation in technology to better prepare them for teaching in the Internet linked, hardware and software rich computerized classroom.

Early in the process of designing the minor in IT in 1999, we conducted a college-wide survey aimed mostly at sophomores and juniors. We asked whether students preferred courses in IT or whether they would choose to take a more formal minor in IT. The survey indicated nearly equal interest in both. The department of instructional technology decided to offer a minor in IT starting in the fall of 1999. They developed a course structure which would prepare students to work directly after graduation by having a significant hands-on component. It was clear that if there was sufficient interest in the minor more courses could be added later on, but at the outset, the identification of a group of core courses was critical. In addition, it was felt that a minor in IT would attract varied interests, not just majors in the filed of education, and students needed a range of IT courses and choices to support their interest.

Our concern was to design a minor where all streams of students, with varying levels of preparation, would receive strong conceptual knowledge of, and, sound skills in computing. We designed a minor that was broad in scope, focused on hands-on skills, and flexible in sequencing. Students, engaged in the four-year bachelors program were required to choose five or six semester-long courses, each offering 4 credits. These courses included: a course called 1) computers for the liberal arts, and a course in 2) spreadsheets (freshman year); 3) communicating and problem solving with computers, 4) design and development of [illegible]tabases, 5) tools and techniques for using the Internet for research, 6) learning and leading with technology in education and the business environment (sophomore and junior years); 7) social and ethical issues in the use of technology and 8)information systems in the workplace (junior and senior years). A few students also chose to do individualized courses.

Our goals in designing this eclectic selection of courses included:

- A felt need to introduce the preservice education major to a wide range of computer concepts and related skills considered critical and essential for their work as classroom teachers and as IT skilled educators. Thus the first course, computers for the liberal arts, was a required course. Students were assessed in computer skills and a few, very few, tested out of this course. It introduced students to basic software skills in word processing, spreadsheets, presentation software, using email and web searching. It also provided a foundation in computer concepts related to hardware, software, networking and ethical issues in IT environments. For those wanting more skills in computing, the spreadsheet course offered greater depth in using formulas, functions and charting.
- To develop skills and attitudes in students appropriate for self-learning and exploration. Students could take courses flexibly during their sophomore, junior and senior years. They could also take courses at other colleges within a consortium without incurring additional fees. Online courses at their own expense were also permitted.
- To ensure that at all times the acquisition of these skills are seen by the students as relevant to the liberal arts education which they were concurrently receiving, courses in the minor were reviewed and evaluated each semester and adjustments made to reflect changes in the field of IT and state mandates for teachers.
- To allow students to gain a sufficiently deep understanding of emerging IT issues and to permit further specialization at the post service level.

In a brief three-year span, the minor in IT has become extremely popular. It offers in-depth IT instruction, significant time and energy invested in advising, and a careful selection of courses within a fairly small rotation of annual course offerings. Instruction in information technology continues to be very challenging due to numerous constraints: the availability of trained faculty, small budgets, classroom space issues, equipment maintenance, IT helpdesk support, overloaded computer networks and network security and management issues. Change and evaluation is ongoing, and an important component. For a small urban college this has been particularly hard given the limited resources available, and the high expectations set by larger institutions. Needed courses were introduced without total replacement of the existing programs in education. Numbers show that the minor in information technology, one of the most popular minors in the college today, clearly filled a much-needed educational and professional void and was successful in meeting preservice educational objectives.

# Models for Collaboration for Pre-Service Teacher Education Programs

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Within the last few years, national standards and guidelines have been created to ensure that tomorrow's teachers are prepared to address the challenges and expectations of a technological society that requires a seamless union between traditional core competencies and new information environments. Teacher education programs are able to address these needs by creating innovative programs and new partnerships that integrate technology within the context of the educational objectives of the teacher certification program. At Florida International University, successful partnerships have been created which address these issues by creating hands on learning experiences that reinforce the learning outcomes developed in the Information Literacy Initiative and the instructional objectives of the teacher education program.

The FIU Information Literacy Initiative seeks to partner librarians and faculty to prepare students to think critically and use information in ways that will enhance their academic, professional and personal lives. Librarians assist the students in the identification of information sources and the retrieval and selection of information; the faculty member creates assignments that require students to use both technology and critical thinking as they evaluate and use information available in print and electronic formats. The intent is to foster information literate individuals who understand the complexity of the information environment and can use the skills they have mastered as a means toward continued development.

The College of Education and the Education Librarian have built a close relationship that has resulted in the creation of library instruction sessions targeted specifically toward future teachers. When Information Literacy objectives are paired with the educational requirements of teacher certification programs, the resulting partnership can yield fulfilling results. One example of a successful affiliation takes place with the "Introduction to Educational Technology" course. Students attend library instruction sessions to research a topic related to technology in the classroom, which is then used as a basis to create a presentation on their topic in PowerPoint format. Students are encouraged to consult with faculty and librarians as they complete their project.

## Perceptions of Technology in Preservice Education Courses

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**Abstract:** This study examined preservice teachers and their instructors' perceptions of the use of technology in their education courses. The current research was part of a larger evaluation project that examined the impact of the first year of Project THREAD (Technology Helping restructure Educational Access and Delivery), a U.S. Department of Education "Preparing Tomorrow's Teachers to Use Technology" (PT3) grant implemented in a large southwestern university. Participants (preservice teachers, N=273, instructors, N=12) completed a survey designed to measure perceptions of technology. Classroom observations and instructor interviews were used as well. Results indicate that instructors who implemented a high degree of technology in their classrooms and created more constructivist learning environments had significantly more positive student perceptions in terms of technology and its usefulness in educational settings.

### Introduction

Preparing future teachers for rapid advancements in technology within our culture and the classroom is on the minds of many involved in teacher preparation programs (Becker, 1996; Garner & Gilligham, 1996). Much of the discussion surrounding this daunting task focuses on teacher knowledge and beliefs about teaching and learning. One definition of this states that, A flexible and adaptive use of technology also implies knowledge, skill, and dispositions beyond simple functional and procedural applications and toward the incorporation of technology in the very fabric of everyday teaching and learning (Gillingham & Topper, 1999, p. 305). How teacher preparation programs are taking up this challenge and affecting change is an important consideration for research.

This study examined preservice teachers and instructors' perceptions of the use of technology in their education courses. The teacher preparation courses in question are part of a College of Education that is making strides to incorporate technology standards such as ISTE (International Society for Technology in Education) into their programs. ISTE standards relate to the integration of technology into teacher education programs. These standards call for teacher candidates to demonstrate a sound understanding of technology operations and concepts as well as the ability to plan and design effective learning environments and experiences supported by technology (ISTE, 2000). In support of this goal, the current research was part of a larger evaluation project that examined the impact of the first year of Project THREAD (Technology Helping Restructure Educational Access and Delivery), a U.S. Department of Education "Preparing Tomorrow's Teachers to Use Technology" (PT3) grant that was implemented.

The purpose of the current study was to gather information regarding the self-reported views of technology and its use by students and instructors involved in a teacher preparation program. We expected that the more and varied technology implemented in preservice teachers' courses the more positive attitudes (both students and instructors) would be regarding the use of technology and its implications for learning.

### Method

As was stated previously, this study was part of a larger evaluation project that examined a PT3 grant implemented in a large southwestern university. Participants (preservice teachers, N=273, instructors, N=12) completed a survey designed to measure their perceptions of technology adapted from a measure developed by Knesek, Christiansen, Miyashitak, & Ropp (2000). The items were organized into five subsections that included questions relating to the concepts of: 1) Experiences with specific technologies in class (e.g., "Experiences with e-mail."), 2) Technology topics addressed in class (e.g., "Using technology to assess student learning of subject matter."), 3) Attitudes toward computers in education (e.g., "Computers can help me learn."), 4) Attitudes toward student use of computers in education"), and 5) Attitudes toward information technology (e.g., "To me, electronic mail is important.").

In addition to the survey, classroom observations and instructor interviews relating to technology use were used as data sources. Observations took place during regular class time and during times when technology assignments were occurring. Faculty interviews were conducted face-to-face or via e-mail and consisted of five questions relating to teaching philosophy in general and the use of technology within the classroom. Observations and interviews were transcribed for subsequent analyses.

## Results

Two levels of analyses were completed.

### Level 1

To examine if individual instructors varied in terms of their students' overall perception of technology, a One-Way Analysis of Variance (ANOVA) was run. This *Overall* composite score was obtained by collapsing the five subscores of the survey. This analysis showed a significant difference between the instructors on the Overall variable, $F(11,195) = 9.71$, $p < .001$. Post-Hoc Tukey comparisons of individual means showed that two of the twelve instructors had significantly higher, more positive, means than their colleagues.

### Level 2

To gather information regarding the classroom environments and instructors involved, classroom observations and interviews were analyzed. More specifically, we were interested in why these two instructors stood out in terms of their students' more positive perceptions of technology found in Level 1 of the analyses. Thematic analyses (Bogdan & Biklen, 1998) of both the classroom observations and the interviews revealed interesting results. Varying degrees of technology use were found within the classrooms. Classroom use of technology in both instructor use and students use varied from very minimal use (e.g., using WebCT as a discussion tool only) to several instances of modeling and required student use of technology (e.g., using imaging devices and editing software). In addition to differences in technology use, our observation and interview data indicated that classrooms varied in terms of the learning environments created. For instance, a small number of classrooms kept a traditional format (i.e., frequent instructor lectures, little discussion, and multiple-choice exams) while others came across as being quite student-centered and constructivist in nature (i.e, frequent discussions and reflection tasks). Differences in class size were also noted.

In summary, what is important to note is that the two instructors who significantly differed from the rest of the group statistically (Level 1 analyses) also differed in the classroom environments they created. Along with several of the other instructors both of the instructors who stood out had technology incorporated into many phases of their course. Interestingly, where the instructors differed the most was in their approach to learning. Based on the data, both of the classrooms were more constructivist in nature than the rest of the group. More instances of opportunities for critical thinking and decision making were evident not only in technology infused situations but in these classrooms in general. In other words, along with increased technology use in the classroom a more student-centered, constructivist learning environment was required to obtain significantly more positive student perceptions of technology.

## Discussion

Our results are consistent with previous theory and research indicating that technology use both by instructors and preservice teachers within the classroom is important in encouraging more positive perceptions of technology and its usefulness in educational settings (Carlson & Gooden, 1999). An additional and very important implication of our research indicates that not only is technology training necessary but a constructivist learning environment conducive to student involvement in technology is crucial (Jonassen, Peck, & Wilson, 1999; Scardamalia & Bereiter, 1996) as well.

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# Videotape Series
# The First Day: Teachers' Ideas and Experiences

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**Abstract:** Creating a First Day of School can be scary, confusing, and exhausting, but also exhilarating, energizing and satisfying. Because so many disparate and unknown components must be imagined, reflected upon, planned and organized, many new teachers often wonder, "Where do I begin? How do I even think about what is needed on the First Day of school?"

In response to student teachers' requests, and recognizing a need for information in this area, the College of Education and University Media Services at California State University, Sacramento, undertook the development of what began as a single videotape, the goal of which was to provide new teachers with an opportunity to learn from, and adapt, "first day" experiences of veteran teachers.

## Production Overview

In the course of the production, a diverse group of six elementary classroom teachers, all teaching in multicultural/multilingual classrooms, were interviewed and three of them were followed while undergoing a first day of school. The wealth of material that was acquired during the production process lead to a series of six subject specific learning modules, all demonstrating how these teachers - diverse in ethnicity, age, experience, and teaching style - think about and implement the first day. Designed to accentuate the feelings and attitudes of the first day as well as to provide concrete activities and address the nitty-gritty details, the series shows intelligent, articulate teachers who share similar aims, but manifest them differently.

The video series has been field-tested with CSUS student teachers, teacher interns, and experienced teachers. The response in every venue has been overwhelmingly positive! Comments have included: "I feel inspired," and "I feel affirmed as a teacher."

"The First Day: Teachers' Ideas and Experiences", with accompanying Facilitator's Guide, is being distributed at cost as a public service to the field of Teacher Education.

## Video Series Module Synopses

**Module #1 Preview: Meet the Teachers**
Module #1 functions as a preview to the entire series. First, we meet the six teachers, and then through excerpts from each module, we experience the flavor of the series, as well as intriguing examples of what's to come.

**Module #2 Planning and Preparation**
In Module #2 the teachers articulate their aims and how they plan for the first day. This module considers particulars such as arranging the classroom, offering choices to their students, developing guidelines for their groups, and connecting with families. It also shows a range of first day activities. Underlying all of the planning and doing is attention to taking account of students' needs and interests.

**Module #3 First Steps Toward Building a Community of Caring Learners**
Teachers know that communities are made, not born. As they aim to draw their students together into a learning community, the teachers pay attention to ways of communicating and building relationships with students and their families. In Module #3 the teachers talk about and we see first day activities that value the common needs and interests of children.

**Module #4 Assessment and Reflection**
With information gleaned from a balance of ongoing assessment and reflection, teachers come to understand individual students and the whole class, which leads to adjustments in their teaching. Module #4 emphasizes the value of embedding informal assessment and reflection in every aspect of teaching and learning. Formal assessments, which can provide useful information, are an accompaniment to this.

**Module #5 Problem Solving: The Expected and the Unexpected**
The First Day is a magnet for interruptions, only some of which can be foreseen. In Module #5, the teachers confront a range of typical intrusions, e.g. late students, and crying children. Then, one teacher deals creatively with some surprising events, including a beguiling bee and a hurting heart; while another responds to a student who needed her continual care and attention all day.

**Module #6 Working with English Learners: The Story of Lyudmila and Julie**
Module #6 differs from the first five in that its form is chronological. We follow the progression of a Ukranian girl who arrives at Kindergarten with her mother. Both do not speak English. Julie, her teacher, strives to create a safe, comforting space for Lyudmila, while providing for the needs of the whole class. We see a range of strategies and activities that support and include English learners, but also we see a compassionate teacher who builds on the Lyudmila's strengths. Initially worried and anxious as she enters Kindergarten, Lyudmila gradually, and dramatically, shifts across three hours toward finding her way into the group.

### Acknowledgements

Any worthy production of this magnitude is built out of the many who contributed significantly in great and small ways. The idea to create a video about the first day of school was the brainchild of Marie Gallegos, a Phase I student teacher at the time. She collaborated as a full, equal partner in the entire endeavor, as did Richard Osborn, our director, who wrought his magic on the strings of video segments, which we brought to him. Foremost, we value the courage of the teachers and their students and their willingness to allow us to tape. We thank CSUS University Media Services and their staff, who not only funded and supported the project, but also believed in its value and importance. We are grateful also to our Special Sponsors for additional funding. Throughout the project colleagues, teachers, student teachers, and friends have given valuable time and feedback to us through field-testing and previews, as well as sustained support and encouragement.

# ITPS: A Performance Based Assessment of Instructional Technology Competencies

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Illinois State University's Technology Learning Circle (TLC), a group formed in 2000 as part of a federal grant, developed an Instructional Technology Passport System (ITPS) designed to ensure that graduating teacher candidates are able to use instructional technology in ethical and effective ways, in compliance with national, state, and institutional standards, e.g. National Council for Accreditation of Teacher Education (NCATE, 2001) or Illinois State Board of Education (ISBE, 1999). The introduction of the standards afforded the faculty an excellent opportunity to develop a system of teacher education performance assessment that can help ensure that teacher candidates graduating from Illinois State University do so with the ability to meet technology standards in preparation for their work in schools.

This paper will describe the unique composition of the TLC, highlight the core beliefs and values that guided their work, and provide an overview of the design and development of the ITPS to date. While significant progress is being made in implementing the ITPS, the reader should note that this is considered a work still in progress. Thus, the paper concludes with a look at the next steps to be undertaken by the TLC in implementing the system to ensure that graduating students from Illinois State University as teachers in the nation's schools will be able to meet the standards for using instructional technology.

## TECHNOLOGY COMPETENCIES IN TEACHER EDUCATION AND PERFORMANCE BASED ASSESSMENT

The composition of the TLC reflected a collaboration among various departments in Arts and Sciences with a role in teacher education, e.g, Physics, Geography, and Communication, together with Curriculum and Instruction faculty as they developed the ITPS. As part of its role in the federal grant that underwrote the work of the TLC, the committee was charged with the task of *"examining and implementing technology-related issues with regard to both K-12 educational settings and college teacher preparation programs."* The Technology Learning Circle has created a project to implement a standard set of instructional technology tasks that will serve as a basis of authentic performance-based assessments that all teacher candidates must complete successfully prior to graduation from Illinois State University.

Based in part upon committee expertise, review of the literature, and experiences at Alverno College – an institution recognized for its "Student Assessment-as-Learning" principle (Alverno College Institute, 1994) – the following core beliefs and values were adopted by the Technology Learning Circle and served as the basis for much of its work.

- Assessments must judge actual performance, not merely intellectual knowledge.
- Assessments can and should be an opportunity for learning.
- Assessments must include "corrective feedback" to the student.
- Assessments represent the learning outcomes of the teacher education unit.
- Assessments, because they represent a minimum of what all teacher candidates should be able to do, must be satisfied at the 100% level.
- Teacher candidates should be proficient in demonstrating their use of instructional technology.
- University faculty will provide a basic introduction to the various performance tasks, but students will be responsible for obtaining in-depth training as necessary.
- Learning is best when there are examples of expected outcomes and public criteria for performance.
- Development of the ability to self-assess is essential to becoming a life-long learner.

The TLC examined both internal and external technology standards, i.e. university-wide standards for students in regards to technology as well as the International Society for Technology in Education. From this examination were derived twelve consolidated indicators that, as integrated tasks, address the multitude of elements presented in the various standards. These indicators were reviewed by a panel of K-12 teachers as part of the development process. The consolidated indicators are general in nature, and relate what all teacher candidates should be able to do at a minimum under authentic teaching conditions. Arguably, any student who completes all twelve assessments encountered in ITPS rightfully can be said to have demonstrated the competencies required by the University and external accrediting agencies. The consolidated performance indicators are as follows:

1. The teacher candidate demonstrates knowledge of ethical standards in the use of technology.
2. The teacher candidate demonstrates the ability to use technology to work effectively and equitably with students challenged by a variety of physical disabilities (including the scanning of text, OCR, text -to-speech applications, image resizing, etc.).
3. The teacher candidate demonstrates an understanding of basic computer terminology and concepts, including fundamental understanding of basic computer operations and an ability to perform simple trouble-shooting tasks.
4. The teacher candidate demonstrates an ability to use a variety of instructional media effectively (e.g., DVD player, CD-recorder, laser disk player, VCR, digital still camera, digital video camera, smart board, document camera, and video projector).
5. The teacher candidate demonstrates the ability to use telecommunications effectively (e.g., e-mail, discussion groups, list servers, instant messaging, etc.).
6. The teacher candidate demonstrates the ability to create and edit the content of web pages, including the posting of the web pages to the World Wide Web (e.g, presupposes ability to use FrontPage, PageMill, DreamWeaver, or Netscape Composer, and inclusion of digital images obtained from a digital camera, etc.).
7. The teacher candidate demonstrates an ability to effectively use web browsers, including the utilization of search engines.
8. The teacher candidate demonstrates the ability to use presentation authoring tools (e.g. PowerPoint, Hyperstudio, etc.).
9. The teacher candidate demonstrates the ability to use idea development software (e.g., Inspiration, etc.).
10. The teacher candidate demonstrates the ability to use spreadsheets (e.g., Excel, etc.).
11. The teacher candidate demonstrates the ability to use database management software (e.g., FileMaker Pro, Access, AppleWorks, etc.).
12. The teacher candidate demonstrates the ability to perform desktop publishing (e.g., In Design, Word, etc.).

It was agreed that these consolidated performance indicators are subject to periodic review and editing in order to take into account the very significant ongoing changes in the field of instructional technology.

Associated with each of these consolidated indicators is an authentic performance-based assessment task that examines student performance and ensures program compliance with adopted standards. This system stipulates that all teacher candidates must demonstrate certain competencies, e.g. designing and manipulating a database to retrieve information or using a desktop publishing program to produce a class newsletter, at various institutional gateways, i.e. beginning of professional studies, student teaching, and graduation.

Students may acquire the knowledge of skills associated with any individual performer at different points in their teacher preparation beginning with their initial undergraduate coursework as freshmen. The TLC decided, however, that the first four performance indicators would be assessed prior to beginning professional studies and such assessment would be conducted at a center dedicated to the work of the TLC. This work includes not only conducting the performance assessments for the first four indicators, it also would be a source of training and retraining for those not successful in their completion of the assessment task. As students successfully complete the tasks at the various gateways described above, progress is posted to their electronic record for which we adopted the metaphor of a passport. That progress could be achieved through continuing assessment of performance based on indicators five through twelve which could take place within the context of a course assignment or through the proposed center.

## NEXT STEPS

The next steps for implementing the ITPS include several critical elements for making the system workable. First, the process of faculty involvement in the curriculum mapping of where the indicators will be mastered is underway. This means that the Curriculum and Instruction program faculty in teacher education, i.e. early childhood, elementary, middle school, and secondary, will have to come to consensus regarding in which courses a particular indicator should be targeted. Upon completion of this curriculum mapping, the process will be repeated for other programs, such as those included in special education.

Along with the curriculum mapping of the indicators, the faculty in the various programs will have to be adequately prepared to use and model instructional technology in relation to the indicators that are identified within courses they are teaching. The university already has a staff development opportunities in place but these will need to be tailored somewhat to meet the particular needs of faculty. For example, it would not be assumed that early childhood faculty would use the same database or graphing program as would a secondary faculty member. While we would expect all faculty to develop the same proficiencies as expected of the students through the ITPS, in the short term we know the busy schedules of university faculty preclude everyone gaining such proficiencies at the same rate. Nonetheless, vital to the success of ITPS is an effective staff development program, as well as on-going technology support for the faculty.

Finally, the performance assessments need to be developed and refined. This step will involve development of authentic assessments by the TLC and, as with the development of the indicators, K-12 teachers will be included in a review process prior to implementation. The assessments must result in products or performances that can be used to document how students actually achieve the indicators as part of the NCATE re -accreditation process that will begin next fall.

Once in place, the model will serve teacher education students well. We believe that our approach is constructivist in nature, which is consistent with our philosophy of teacher education at ISU. It incorporates best practices in assessment and is consistent with the changes in accreditation developed by NCATE as we approach our re-accreditation. Finally, the process has involved faculty in such a way that a feeling of ownership for this curriculum development effort has developed beyond those of just the committee who created it. In general the faculty has readily embraced our work and to date there has been very little resistance. The committee eagerly looks forward to completing the above mentioned. of work.

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# Successful Infusion Of Technology Throughout A Teacher Licensure Program

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**Abstract**: For the past two years Belmont University's Department of Education faculty has infused 28 technology competencies throughout its pre-service teacher preparation program. These competencies are the competencies required for teacher licensure by the State of Tennessee. The technology course that pre-service teachers and interns were required to complete in the past is no longer offered. Now pre-service teachers and interns develop these competencies and demonstrate them by completing the technology tasks that are embedded into course assignments and into the internship. This paper describes the process we used to infuse technology throughout our licensure courses, and lists recommendations for strengthening the infusion based upon a survey of Belmont's pre-service teachers, interns and faculty.

## Introduction

Some teacher preparation institutions have successfully infused technology into their programs (Cooper, et. al., 2000; Woodruff et. al., 1998). And yet, while incentives and resources to train faculty to infuse technology are available (Niederhauser, 2001), researchers continue to report that education professors do not model the use of technology in teaching their courses (Deal, 1999). The purpose of this paper is to encourage more teacher preparation institutions to follow Belmont's lead and successfully infuse technology throughout their teacher licensure programs.

## Our Infusion Process

In 1999-2000, Belmont participated with Nashville Metropolitan Public Schools and another local university in a PT$^3$ catalyst grant (U.S. Department of Education, 2000). The grant specified that the Belmont faculty use an online self-assessment tool to rate their own technology skills. During a private interview, each professor (1) developed a list of personal technology strengths and weaknesses based upon the self-assessment results, (2) determined which technology skills were already included or taught in the professor's courses, (3) developed strategies to infuse (or further infuse) technology into the professor's courses and (4) identified special training and/or resources the professor needed to successfully infuse the technology. Belmont faculty subsequently approved a course matrix of infused technology competencies. Our education technology professor then coordinated the infusion and team-taught the competencies with the faculty in their courses, and moved the technology assignments in selected courses online using WebCT. Pre-service teachers were then required to access and to complete selected technology tasks online in WebCT in the first core licensure course (Foundations of Education), and in the Professional Development Site (PDS) 15 credit hour Methods Block course. Interns in Belmont's 15 month Internship program used WebCT to record daily journals, submit unit and lesson plans, and to complete other assignments for review and comment by Belmont faculty and PDS mentor faculty. They also completed a technology workshop in WebCT that taught them how to construct a web page for their students to use in the classroom, and how to use Microsoft's free software (NetMeeting) to videoconference their classrooms with other classrooms.

## Assessment Of The Infusion Effort

In the fall 2001 semester, our pre-service teachers, interns and faculty completed a survey to help determine the extent to which infusion provided opportunities to develop technology skills, and how the infusion can be improved. Based upon the survey results, the following recommendations were submitted to the Belmont faculty:

- Since Belmont now has a new computer proficiency course that all entering students must complete during their first semester, infused competencies that are taught and/or verified in the proficiency course should not be taught in the licensure courses. However, skills that are required by the state of Tennessee and that are not taught in the proficiency course should be taught throughout the licensure courses, especially in the methods block course and the Internship,
- In the first core course, Foundations of Education, students should be introduced to WebCT because they will need to use it as they move through other licensure courses,
- Pre-service teachers and interns should be required to systematically demonstrate competencies in a broad range of assignments and practicums throughout their courses,
- Bi-weekly technology sessions should be conducted on site at the PDS schools. These sessions should include instruction on how to infuse technology into the curriculum, how to construct and maintain a teacher web site, and how to use a variety of technology resources.
- Since interns complete core courses during the summer before they begin their internships in the schools, these courses should include additional introductions to technology resources (e.g., computer projector, digital camera, videoconference software and hardware) and additional opportunities to construct lesson plans that include the use of technology resources.

## Conclusions

At Belmont we believe that the following are necessary for successful infusion:

- First and foremost, a faculty committed to infusion as evidenced by its willingness to develop personal technology knowledge and skills, and to model the use of technology in their courses,
- Second, clear explanations by administrators and faculty to students about the infusion plan and why students are no longer required to take a stand-alone education technology course,
- Third, an understanding of and approval of the new role of the faculty member who teaches education technology as evidenced by an assigned workload, which includes time to plan and time to team-teach with other faculty members, and
- Fourth, a commitment to regular and systematic assessment of the infusion effort

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# Simple and Effective – Teacher Roles Remain a Powerful Framework to Embed ICT Within the Practice of Teaching

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**Abstract**: Teacher roles of learner, manager, designer and researcher provide a simple framework to embed ICT within the practice of teaching. They have been used to convey the impact of information and communication technology within compulsory ICT subjects in the Faculty of Education at the University of Wollongong for five years. The roles have been adapted to suit students studying ICT on campus without simultaneous classroom access (Example A), to frame ICT on practicum (Example B), and to structure video vignettes of local teachers working with ICT (Example C). Each examples is explored in relation to the sequence or clustering of roles, their dependence on context, their relationship to an electronic portfolio, and the degree of support required. These fundamental roles facilitate communication among pre-service teachers, new graduates and experienced colleagues to enable professional development for *all* teachers.

## Introduction

The integration of information and communication technology (ICT) in teaching practice provides a challenge for pre-service educators. If you maintain a separate focus on ICT you can be lured into emphasis on a skill set; embed ICT within all subjects and you run the risk of assuming "someone else has covered that." Couple with that simplistic dichotomy a range of interpretations of "integration" and you have a complex problem for pre-service educators who require not only big picture thinking of leadership, but also faculty wide support.

In its most basic form, integration can be met by development of student skills with ICT tools and these skills can simply be mapped across subjects in a degree program. Other more pedagogical interpretations of integration require substantial alterations to tertiary teaching practice, either through emphasis on student-centered activity design, the development of high quality on-line resources and interactive learning experiences, or whole program re-structuring as a consequence of use of ICT. Theory and practice can be linked through communication tools and communities established in a virtual environment that is capable of bridging the pre-service to school divide.

Within such complexity, it is often simple structures or ideas that resonate with different groups. In this case it is the anchor point of fundamental teaching roles – learner, manager, designer and researcher. The temporary separation of these four teaching roles permits a closer examination of associated skills, processes and ways of thinking. The teacher as *learner* must be a sophisticated and technologically literate information processor, with a considerable degree of self-regulation, internal motivation and a lifelong approach to learning. It is easy to see how this role instantly addresses student attainment of core ICT skills. The teacher as *manager* must be highly organized and logical, capable of great attention to detail with personal and teaching resources, student work, classroom layout and management and reporting of student capabilities. Since many capable learners struggle to organize or archive their own work and fail to see the virtue of developing a personal information management system that outlives short-term needs, the transition to managing the additional work of a class is far from minor. The teacher as *designer* must be able to creatively design student activities to meet a range of learner and system needs in a given environment. Activity design is problem-solving that draws on learning theory, on management experience and on interpersonal skills. The more a teacher moves from a didactic to a facilitator approach, the more flexible they must become as problem-solvers who are required to "think on their feet". The teacher as *researcher* must monitor practice, maintain a focus on professional development, collaborate with teaching peers and reflectively improve their practice. This demands feedback from students and fellow teachers and a willingness to accept constructive criticism.

Classroom reality weaves multiple teaching roles together in ways that are highly context specific. Since evaluation is an integral component of any teaching role, and assessment drives much of what is learned in schools today, assessment and evaluation are embedded within the roles. The four teaching roles of learner, manager, designer and researcher have been used as the framework for conveying the impact of information and communication technology within compulsory ICT subjects in the Faculty of Education at the University of Wollongong for the last five years. They have been adapted to suit students studying ICT on campus without simultaneous classroom access (Example A), to frame ICT use on practicum (Example B), and to structure video vignettes of local teachers working with ICT (Example C). Each of these examples is now explored in relation to the sequence or clustering of roles, their dependency on context, their relationship to an electronic portfolio structure, and the degree and nature of teaching support required (see Tab. 1).

| *Examples* | *How roles unfold or relate* | *Influence of context* | *Relationship to electronic portfolio* | *Nature of Support required* |
|---|---|---|---|---|
| A. Students studying ICT on campus | Learner<br>Manager<br>Designer<br>Researcher | Minimal background knowledge of teaching;<br>Complexity gives team message | Portfolio takes a process approach – students begin to develop a professional archive with functional categories. | Intensive in tutorials with skill development and beginning of pedagogy<br>Substantial support with file management |
| B. Students using ICT on practicum | Researcher<br>Designer<br>Manager<br>Learner | Starting point of class and school research to design ICT-integrated activities with supervising teacher | Portfolio is a product (central report) with associated files – resources, lesson plans and student work. | Support largely from class teachers on practicum; support later with portfolio submission |
| C. Classroom-based video resources for students in A or B | Learner and Manager focus on the teacher.<br>Designer and Researcher focus on students and student/teacher interaction. | Very dependent on the school as to ICT resources, infrastructure and teacher involvement with students | Trigger material for students and part of a professional portfolio for the teachers. | Video production and preparation for student viewing; ethics clearance with teachers and students. |

**Table 1**: Relationship of teacher roles for ICT integration to context, electronic portfolios and student support

## Example A: Students studying ICT on campus without classroom access

The core compulsory first-year ICT subject for all pre-service teachers in our Primary (elementary), Early childhood or secondary PE/Health program has changed dramatically over the last few years. The 1997 subject re-modeling of *"Information Technology for Learning"* geared to the state ministerial guidelines for the integration of ICT into classroom practice. Skills and pedagogy were translated into basic skill tests, design of lesson activities incorporating ICT, exam testing of concepts and resource support through a textbook and web site. Although the themes of learner, manager, designer and researcher were embedded in the lecture structure, it was not until the 2000 subject revision that these teacher roles became explicit.

In 2000 skill tests were replaced by paired student activities (database, multimedia presentation and web-based activity), the exam questions were unfolded weekly via asynchronous discussion so students could develop and share ideas, and a process oriented electronic portfolio was introduced. The aim was to functionally anchor skill development, allow students to develop file management skills within a designated folder structure, model the organization and collection of electronic student work, and allow students to choose a cluster of activities that suited their interest and degree. The choice of portfolio activities in the 2000 subject offering is presented in Tab.2, accompanied by the number of students who chose each option, and the subsequent options offered in 2001. Students were asked to choose one activity from each category.

| *2000 Portfolio categories* | *No. of students attempting options in 2000* | *Options for 2001 based on 2000 figures* |
|---|---|---|
| **Teacher as Learner** | | |
| A-My Learning Style | 111 | A- My Learning Style |
| B-Journal | 44 | *B –(new) Learning strategies in activities from 2000 (presented as a resource CD)* |
| C-Learning style of Peers | 55 | |
| **Teacher as Manager** | | |
| D-Folders of related material | 80 | C – Folders of related material with a map showing relationships |
| E-Resources database | 74 | D – Resources database |
| F-Spreadsheet | 19 | |
| G-Contacts | 37 | |
| **Teacher as Designer** | | |
| H-HyperStudio or CHP | 48 | E – HyperStudio or CHP |
| I-PowerPoint | 106 | F – Powerpoint |
| J-Classroom Layout | 35 | |
| K-Template for an activity | 21 | |
| **Teacher as Researcher** | | |
| L-Web page of annotated links | 189 | G – Web page of annotated links |
| M-Database | 11 | *H – Further research on discussion forum question (new)* |
| N-Database | 10 | |

**Table 2**: Portfolio options offered in 2000 and 2001 in "Information Technology for Learning"

Subject re-vision for 2001 was once again substantial. Lectures provided information, introduced themes, explored and modeled resources and allowed a core team of three lecturers to weave together coherent but diverse approaches to ICT integration. The exam was replaced by an online discussion activity that required students to contribute at least two substantial entries to the question of their choice, summarize and reference the work/comments of their peers, then draw some conclusions. The process of analyzing themes produced much deeper student processing of the pedagogy of ICT integration than previous exam answers, allowed students to identify many writing styles, use a powerful cognitive tool, and research and present data. Educational software review was re-introduced within tutorials, permitting groups of students to experience the technical issues of software installation, review the pedagogy and discuss classroom application. The electronic portfolio for 2001 remained anchored to the four roles, but options were reduced to two within each category on the strength of the popular choices made by students the previous year (see Tab.2). In addition, CDs of sample student work from 2000 were supplied within tutorials to help frame expectations and reduce over-reliance on any single example.

One constant from 1997-2001 is the sequence of unpacking teacher roles– begin with the learner (where they are at), follow with the manager (relate to practical issues in the classroom), progress to designer (creative application of pedagogy) and cap off with reflective and organized researcher. These four roles can be used to illustrate *some* of the diverse ways a teacher must think and operate (reduce initial complexity), and to allow pre-service teachers to accept that they may not be equally comfortable or proficient at all teaching roles. This provides a strong rationale for teaching as a team enterprise, particularly in an ICT-rich environment, given the potential complexity of the technology.

Students study this subject in the second session of their first year of a three or four year program, hence their school practicum experience is limited and they may not be fluent flipping between teacher and learner hats. Introducing the teacher as learner permits them to step straight into the teacher role as a novice, and models the idea of lifelong learning and professional development.

The four roles become explicit within the electronic portfolio, where the key emphasis is on assisting students to develop ongoing electronic information management skills that will permit them in their later years to take a product approach to portfolios for assessment and ultimately presentation to potential employers (Brown 2002). Students are asked to construct four folders to contain work related to teacher roles (see Tab.2).

The support students require has shifted progressively from the development of application skills to the pedagogical application of those skills, largely due to increased acceptance of the role of ICT rather than increased skill base. Peer tutoring is critical, and the use of fourth year students as demonstrators has been mutually beneficial. Surprisingly, basic computer skills are the most lacking - many students are highly competent using specific applications on their home machine, but have no understanding of how to transfer documents using portable media. The typical requests for a print copy or electronic submission through web-based course support systems bypass such file transfer and can mask inability to complete simple movement of documents in a non-networked environment such as might still exist within their first school placement. Emotional support is critical in this subject, particularly for both ends of the experience spectrum. Those with little past experience feel intimidated, while those with sophisticated skills in a limited range of applications may initially fail to realize their role is to help others learn to use ICT for learning in addition to maintaining and expanding their skill base.

## Example B: students using ICT on practicum

The one-year Graduate Diploma of Education (GDE) program began incorporating a specific focus on ICT in 1997, when a 9-week series of lectures and tutorials was placed at the end of the annual subject "Pedagogy". In the following three years (1998-2000) a 6-8 week block of Pedagogy early in the year was allocated to ICT integration to allow for skill development throughout the year. The 2001 iteration adopted an extended approach to ICT as a stepping-stone to course redesign with an ICT backbone in 2002. Although the lecture series was placed in session one of the year, the bulk of student assignment work was due in second session, permitting a focus on ICT use within the major mid-year practicum. Lectures and tutorials were merely the source of resources, ideas and support for subsequent application in the classroom context. The four teacher roles were made explicit through the electronic portfolio as they relate to the teaching cycle. Students first *research* their school ICT environment, *design* activities with their supervising teacher, *manage* those activities and finally *evaluate* what they have learned (based on observations, supervisor feedback and collections of student work).

The brief nature of the GDE program relative to Example A, coupled with the ability to anchor ICT experience within the practicum necessitates that students jump straight into the teaching sequence. The electronic portfolio requires them to stitch their experience together in a structured report (product), accompanied by electronic folders containing resources, activities and student work they can archive for subsequent access (part of the ongoing process). The request for students to note all available resources means they have a record for future use, and the request for samples of student work models the need to look at student work to make a meaningful self-assessment of their performance. The key time students need support is during and after their practicum, so future plans to "backbone" ICT activities throughout the year seem highly appropriate.

## Example C: video vignettes of local teachers working with ICT

The lectures and tutorials in Examples A and B do not occur at a time when students have access to the classroom. They often have trouble relating to the classroom context, and frequently question the expertise of a university lecturer relative to the school classroom context. One solution (tried 1998-2000) was to involve a range of classroom teachers as guest lecturers. Considering the diversity of courses in either of these subjects, it is very difficult to balance the range of needs against the internal coherence of a lecture set. The pair of lecturers in 2001 provided internal consistency - for classroom links in the future, we are pursing the collection of video cases from local schools.

The four roles are aligned to link pre-service and practicing teachers. The *learner* and *manager* focus on the teacher. The aim is to tap into the thought processes and reflections of the classroom teacher about ICT integration and the management issues involved in planning, monitoring and collating student electronic work. The *designer* and *researcher* relate to the interaction between teacher and students. What kind of activities do teachers design that seamlessly integrate ICT? Can we hear the teacher's reflections on what happened? How do students work with ICT? A case may represent one teacher, or a school group. Video vignettes feature teacher reflections on the use of ICT in the classroom (learner); equipment, layout and management of student work (manager); student activities with before and after thoughts of the teacher (designer); students engaged with ICT in individual and group work (researcher).

Every teacher and classroom is unique. This process begins a video vignette collection that can grow and be used flexibly for professional development of teachers generally (see Tab. 3):

| | Teacher A | Teacher B | Teacher C |
|---|---|---|---|
| Learner | | | |
| Manager | | | |
| Designer | | | |
| Researcher | | | |

**Table 3**: Potential combination of video vignettes as the basis of many class activities

One collection of vignettes could be the profile of a particular teacher, such as "Teacher A" (Tab.3). Alternately, the manager theme could be explored for comparison and contrast of a range of classroom environments with respect to technical infrastructure and resources. The value of the vignette structure lies in the re-usable nature of the individual elements that might find their way into web pages, onto a DVD or projected for discussion within a tutorial. They rely on the creativity of the activity designer to "come alive" from multiple perspectives for many educational issues. The teachers at the heart of the case studies are gaining valuable resources for *their* professional portfolio. This process also models the benefits to be gained from close observation and analysis of your own teaching. Monitoring and sharing cases provides many starting points for great professional development. Video production requires significant support to ensure high quality. The video editing and processing are complex, but may also be the most valuable part for either students or teachers. Alternately, students could capture the case studies.

## Conclusions

If our goal is to support the prime endeavor of learning that is active, constructive, collaborative and intentional through transparent use of ICT, then we have to look at the fundamentals of teaching and transcend the particulars of technology. Teacher as lifelong learner, teacher as manager, teacher as creative designer and teacher as reflective practitioner appear to offer some promise. These roles may facilitate clear communication among pre-service teachers, new graduates and their experienced colleagues to allow for the concept of professional development for *all* teachers. Teaching in an ICT-rich environment tips the load for teachers and demands teamwork (Jones 2001). These roles provide a simple means of teachers dividing the labor, acknowledging that as classroom generalists we are naturally better at some things than others. The roles also provide a team structure for targeted professional development activities within a school. All teachers present a unique profile of proficiency with ICT. The real challenge may be to deal with the emotional issues surrounding effective teamwork (Luca and Tarricone 2001).

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# The Design of a Computer-Based Review for the ExCET

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To be certified as a teacher in the state of Texas a candidate must pass the Examination for the Certification of Educators in Texas (ExCET). Students today spend four years or more in education programs taking courses intended to prepare them to become teachers. At the end of the program students must pass a test such as the ExCET that is a prerequisite for becoming a teacher.

Texas is now holding the teacher education program responsible for the success of teacher candidates on certification examinations (Hernandez, 1999). Universities may lose their teacher certification programs if their students do not pass the certification tests. Because of these consequences, colleges of education are beginning to prescreen students who desire to enter their teacher preparation programs, requiring students to meet specific GPA and basic skills standards before being admitted to the programs (Hernandez, 1999). There is currently a shortage of certified teachers in Texas and prescreening students who desire to become teachers has the potential effect of eliminating some people who could become very good teachers. There is a need to develop a computer-based examination, that can be used to prepare students for the ExCET and to study the effect of this computer-based examination on their ExCET scores.

Books and Manuals do not provide enough interactive preparation for the ExCET. Most ExCET preparation manuals today include examples of ExCET tests. These tests encourage students to take the whole test first and then check their answers. These manuals provide detailed written explanations of the answers at the end of the test. In an inefficient manner, students must turn back and forth in these books if they want to check their answers.

Computers-based education allows students to quickly compare their responses to the correct answers. Computers do not ridicule student's answers, and students can work at their own pace at each concept before they advance to the next. Computers can provide students instant feedback that can tell the student why their answer is right or wrong.

The purpose of the study was to design, develop, and evaluate a computer-based test that provides teacher education students with a review for the ExCET. The design and development process for the test was defined by a group of stakeholders that included the designer/programmer, teacher educators, an author of a print-based ExCET review, and teacher education students. This study provided information regarding the following concerns evolving throughout the development cycle: (1) content; (2) screen design; (3) feedback; and (4) evaluation.

The focus of this study was in four distinct areas: test design, test development, implementation of the test in an authentic context, and evaluation from students and faculty. The results are reported in both quantitative and qualitative measures that reflect feedback from surveys and test results. Constructivism was the foundation for both the design and development of the test, and participatory design guided the process.

The overarching principles of reflection and recursion were critical for this design model. Recursion provides the opportunity for stakeholders to revisit and rethink the materials in a cyclical method throughout the development of the software. Reflection provides the opportunity for all of the stakeholders to think about and reflect on the design and development decisions that have been made and change them when needed.

The idea for the program originated as the competencies and domains were introduced to teacher educators. The teacher educators noticed a need for software that would help students prepare for the ExCET. The development of the program incorporated the suggestions, propositions, and plans of teacher educators making these contributors an important part of the project. The teacher educators grew from being contributors to become stakeholders in the project. Students who participated in the trials made many suggestions as part of a formative evaluation. These suggestions made many improvements to the program which made the stakeholders feel that the program was their program. Finally when one stakeholder suggested that the future version incorporate video, ownership was divided evenly by all the stakeholders. The project is now a very important part of the ExCET review.

# Using Problem Based Learning to Prepare Students for IT Leadership Positions in Schools

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### Abstract

Teachers take on a wide range of roles in a school, yet most teacher education courses prepare students for only the role of classroom teacher. A problem based learning approach to teaching and learning and IT-based resources in a technology-rich learning environment are combined to provide undergraduate education students with an exciting and innovative way to learn about IT in schools. This paper explores how problem based learning and technologies are utilized to provide powerful opportunities for learning about IT in schools through: solving authentic tasks; taking on leadership roles; working as a team; and collaborating on solutions to authentic ill-structured problems. Students taking this subject have reported over a three-fold increase in confidence in tackling IT problems in a school, in addition to development of content knowledge and transferable leadership skills.

## Introduction

The roles of a teacher include not only teaching and classroom activities, but also many other roles such as curriculum planner, decision maker, human resources manager, technology manager, team member, and team leader. A problem based learning (PBL) approach is used in the subject *Information Technology (IT) in Primary Schools* at the University of Melbourne. This approach enables us to project undergraduate students into their future role as teachers, to enhance their learning, and to prepare them for the varied roles of a teacher through authentic tasks and scenarios. The subject is supported by a website that includes a rich description of a fictional primary school [named 'Federation Primary School' in honor of Australia's centenary of federation in 2001] and its inhabitants in which the problems are set, and the subject is conducted in a technology-rich teaching space (see Arnold & Gruba, undated, for a description of the teaching space and the resources available in it). Although the teaching space was very well-equipped, this level of technology is not considered to be vital to running a program such as that described here.

This subject is part of the Bachelor of Education (Primary) [B.Ed.(Primary)] degree, which is a four year course of study and the principal vehicle for the education of primary (elementary/K-6) teachers at the University of Melbourne, a research intensive university in Melbourne, Australia. During the third and fourth years of the B.Ed. (Primary) degree students select one optional subject each year, allowing students flexibility to strengthen an area of interest or to broaden their knowledge. *IT in Primary Schools* is an optional subjects and runs over two semesters with a two-hour block each week. The tasks students undertake are designed to develop their content knowledge about IT and its uses in a school, to give students experience of working as a team, and to develop skills and knowledge about being a leader in the context of decision-making about IT issues in a school. It is considered that the leadership skills developed will be transferable to other roles of leadership in schools and elsewhere.

Using a PBL approach for this subject (first taught in 2001) was examined for a number of reasons — new graduates told us that in their first years of teaching they were made members of the Information Technology Committee (or equivalent) at their school (a big role for a new graduate!) and PBL appeared to be an excellent means of facilitating the transition of our students from the role of a student to that of a education professional. Thus, this subject gives our students experience in tackling the kinds of IT issues that they are likely to encounter when a teacher and to experience the roles of committee member and chair of a committee with responsibilities for developing a report with recommendations for a School Council or the principal. PBL allows students to develop both the content knowledge and the transferable skills required for the many roles of a teacher, with this subject having a particular focus on leadership roles.

## Using PBL to Support Learning

Finkle and Torp (1995) describe problem based learning (PBL) as:

> *"a curriculum development and instructional system that simultaneously develops both problem solving strategies and disciplinary knowledge bases and skills by placing students in the active role of problem solvers confronted with an ill-structured problem that mirrors real-world problems".*
>
> Finkle & Torp (1995)

The subject employs a problem based learning approach (see also Stover, 1998; Stepien & Gallagher, 1993) and each problem is explored in a four week cycle (see Table 1). The students work in teams of four students and tackle four problems involving IT in a fictional primary (K-6) school over the course of the academic year (two semesters). The problems are: Integrating IT into the Curriculum; Developing a Three year IT Budget; Developing an IT Professional Development Plan; and, Developing a Three year IT Strategic Plan. For each problem the team prepares a written report that are the recommendations to the School Council and the team presents their proposal, as if to the School Council.

The role of the team is that of the school's IT Committee that respond to briefs developed by the principal or School Council. The team leader is in the role of committee chair and the team members act as committee members. Teams meet in scheduled class times once each week and may also meet – electronically or in person – outside scheduled classes. Students used telephones, email and short messaging system (SMS, on mobile telephones) extensively to communicate outside class times. As the year progressed scheduled classes were reduced.

The subject had no lectures or formal workshops about any of the content areas. The first two sessions of the subject were used for the class to discuss issues that would prepare students for this mode of learning, as this was the first subject the students had undertaken using a PBL approach. Discussions included how the subject would operate and students were directed to resources about problem based learning and the roles of team members and team leaders were discussed extensively and students defined the characteristics of a good leader and team member. These introductory sessions were time well invested and made explicit to all students what their colleagues saw as good team behaviors.

The class met for a two hour block each week with staff only addressing the whole group at the start of each problem (week 1) to raise general issues about the topic and field questions and in the class that teams presented their recommendations (week 4) staff chaired the session and managed the discussion and the students critiquing of presentations.

| |
|---|
| **Week 1 (of 4 week cycle)** |
| • An introduction to the problem & a discussion that raises general issues related to the topic. This is supported on the subject's web site with notes, links to useful sites and articles, and supporting artifacts about the scenario for the problem. |
| **Weeks 2 & 3 (of 4 week cycle)** |
| • Teams work on the problem, with staff available to mentor the teams. Staff & experts (principals, teachers, and others) are available (via email) to team leaders. |
| **Week 4 (of 4 week cycle)** |
| • Teams present their recommendations to the group, the style is similar to a School Council meeting and students critique and discuss the recommendations of each team. |

*Table 1. Activities during the four week cycle of each problem.*

## Development of Leadership Skills

Students are assigned to the role of team leader on a rotating basis and are responsible for compiling and submitting the report and coordinating their team's presentation. This allows students to gain experience in working as a team and in leading and coordinating a team to meet a deadline. These are highly valued transferable skills for students to gain, in addition to the content knowledge developed. In the first sessions of the subject students, as a group, described the characteristics of a 'good leader' and the sorts of behaviors a good leader would have. Characteristics and behaviors of good team members were also described and discussed. This discussion was quite extensive with students drawing on both their positive and negative experiences of working with teams. Students were also encouraged to engage with literature about team leadership skills, team management and team participation via links on the subject's website.

During the course of the subject each student was team leader for one problem and the role was taken seriously by students and staff. At the conclusion of each problem students were required to reflect on a number of aspects of the problem including on how the team process had worked and how they would have handled the team had they been team leader. This reflection enabled students to consider how well the team leader had managed the group and to consider alternative ways the process could have been handled. The reflective process as part of the cycle is an important aspect of

PBL (Holen, 2000). Thus, although each student was team leader for only one problem, they had many opportunities for critiquing the leadership of others and projecting themselves into the role of team leader.
The following quote from a student at the end of the subject exemplifies some of the learning students had about working in a team and in leading a team.

> *The subject has many strengths, these included working in a team and having team-leaders. Having experienced four different teams, it was clear to see when a team had a leader with the right qualities. For successful leadership, organization, initiative, vision and negotiation is needed. At times the leader has to be frank and direct and keep things moving along. In successful team work, there has to be balance of roles and work load, there has to be sharing of ideas and there has to be a willingness to help out each other and be honest to each other about concerns that might be facing the team.*

## Development of Content Knowledge

In this subject there were many aspects of knowledge development. Some of these are:

- Students developing a knowledge of the body of literature relating to IT in schools. For example, students investigated the research basis of different models of professional development when designing a professional development program for teachers in the school and had to investigate theories of learning when planning the integration of IT into classroom activities.

Although no 'content' was taught in this subjects it is believed that students' learning in this area was enhanced because the students themselves determined what they needed to know for each problem. Another powerful learning outcome was students developing the skills of finding and making sense of reliable information and applying it to a problem at hand.

- Students becoming conversant with currently used software and hardware and educationally sound ways these can be used in the primary classroom and becoming experts on current government Education Department policies and requirements regarding IT in schools.

It is acknowledged that the details of these are only ephemeral, but the skills in finding and evaluating this type of information are of ongoing value.

- The information literacy skills of students were greatly enhanced during the subject as students were given links to only basic sources.

As the year progressed the information literacy skills of the students blossomed, as did their confidence and autonomy in taking control of their learning. Students also developed a rich knowledge of useful and reliable sources of information about matters relating to IT in schools.

- Students developing a rich understanding of working in a team and in leading a team.

It must be acknowledged that not all team work was 'plain sailing' and for some groups difficulties did occur. These were viewed as learning opportunities and students involved were encouraged and supported in sorting out any difficulties as they arose.

- The richness of description of the fictional school, and the authenticity of the characters of the school meant that students developed some understanding of the complexity of working in a school and understanding the political and personal minefield that getting staff to use IT in their teaching can be!

Some staff members of the fictional were deliberately 'awkward', such as the teacher who saw herself as an IT leader in the school (because she had been an early adopter of IT), but had not changed her classroom practice in 15 years!

It must be noted that none of the content was 'taught' to the students — that is, there were no lectures or tutorials in which staff did traditional teaching about these content areas. Students developed their own knowledge in the various aspects of implementing IT to support teaching and learning in a school as it was required for each problem, which highlights the importance of well-designed problems. As the students defined what *they* needed to know to work through the problem they were in an optimal state for learning.

When students approached staff with questions about finding information or how they might tackle a problem, staff did not take on a didactic role at any stage and did not tell students where to find information or what the next step might be. If the problem was informational, staff modeled to students how they might go about finding out such information (but did not give the information to the student) or bounced questions back to the students to get them to find the next step. This methodology of scaffolding students worked extremely well. As the year progressed the scaffolding was progressively withdrawn as students developed skills and no longer required support to tackle the problems. By the final problem the class did not meet between weeks 1 and 4 of the problem (a staff member was available in his office if any help was required – it wasn't!) and teams worked on their own on the final problem. This is pleasing as these were final year students who will be practicing teachers within months of completing this subject.

## Student Responses to the Subject

The subject was offered for the first time in 2001 (February to October 2001). Students responded very positively to this style of learning and developed skills and understandings not developed elsewhere in their studies. The first semester (February to June) feedback from students in the University's 'Quality of Teaching' survey (University of Melbourne, 2001) was excellent — average scores for the questions ranged from 4.4 to 4.9 out of a possible 5. These are substantially higher than the University averages. The results from the second semester of the year-long subject were even higher, with a 'perfect five' scored on four of the nine questions — this indicates that all students surveyed gave the highest rating for that question. Averages of other questions ranged from 4.6 to 4.9 — which are well above the university averages. That the response to the statement 'The subject was taught well' scored 4.6 in semester 1 and 4.9 in semester 2 is both pleasing and interesting, as there was no 'teaching' (but lots of learning!) in the subject. Student satisfaction with the subject is also suggested by an almost doubling of enrolments in the subject for 2002 as positive 'word of mouth' about the subject was passed onto the students of the following year.

The effectiveness of this approach to teaching and learning is indicated by the following quote, which is from a reflective piece from a student in the subject:

> *I had to think about the school's philosophy and charter, as well as think about what the teachers hope to achieve and what learning environment they want. These were not easy, they took strategic thinking – hence a strategic plan – I was constantly asking myself, is this really achievable? Is this realistic?*

The following quotes from students indicate the immense value that they found in this style of learning:

> *This is an amazing subject that has taught me an unbelievable amount of knowledge. When reflecting back on the year, I can see that I have grown personally, academically and professionally.*
>
> *Through this subject, I have been prepared to face the challenges that come with including IT in a school's curriculum in a direct hands-on fashion, in that I was forced to think of the problems in a realistic manner, and solve it in a practical and sensible way that would work in a real school.*
>
> *One of the things I really enjoyed was the problem based nature of the course. It gave me a sense of empowerment to know that we were directing our learning and were in control of it. That is how it really works from now on for us — that is, we need to have the skills to be able to go out and find things for ourselves.*

These comments from students' reflective writing indicate the very powerful possibilities of using PBL as part of the learning process.

## Pilot Evaluation of the Subject

At the conclusion of the subject, as a pilot evaluation of the subject and the students' learning, a subset of students were asked to complete a series of simple questions (Table 2). This was undertaken both to inform us of students' perceptions of their own progress and to direct them in reflecting about their own learning. [As only twelve students were asked to complete these questions it is acknowledged that these data are preliminary and form part of a pilot study of the subject and its outcomes]. As can be seen (Figure 1) both the confidence and the content knowledge of the students surveyed increased substantially over the duration of the subject. Although these data are froma pilot study with a small number of students and are not suitable for statistical analysis or the drawing of major conclusions, data suggest that this subject has made a large impact on the students surveyed and, for these students, has contributed in their development as a professional and as a useful and valuable member of a school community. Thus, it appears that PBL can provide a rich learning experience for students developing both content knowledge of implementation of IT across a school and the transferable skills and knowledge for them to take up leadership positions in schools. [Further investigation of confidence in leadership roles will be made with currently practicing teachers and with other final year students.]

| Questions |
|---|
| At the beginning of this subject my confidence level in taking on position on a school IT committee was ____ out of 10. |
| Now my confidence level in taking on position on a school IT committee is ____ out of 10. |
| At the beginning of this subject my confidence level in taking on a leadership role in a school was ____ out of 10. |
| Now my confidence level in taking on a leadership role in a school is ____ out of 10. |
| At the beginning of this subject my knowledge about issues a school IT committee would consider was ____ out of 10. |
| Now my knowledge about issues a school IT committee would consider is ____ out of 10. |
| At the beginning of this subject my knowledge about issues a leader in IT in a schools would need to consider was ____ out of 10. |
| Now my knowledge about issues a leader in IT in a school would need to consider is ____ out of 10. |

Table 2: Questions from a pilot evaluation of students' perception of changes in their confidence and content knowledge

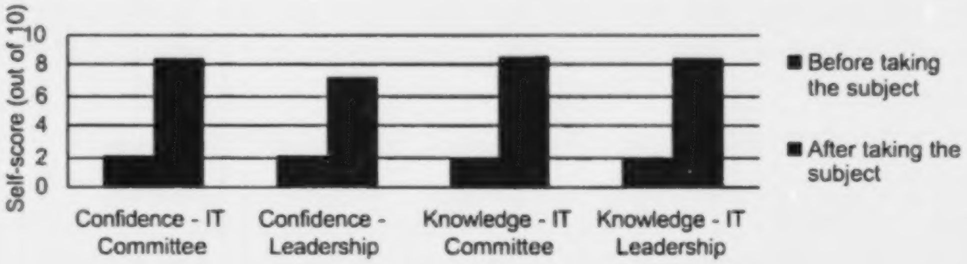

Figure 1: Students scores (averages) of their confidence and content knowledge before and after having completed this subject (N=12). [See Table 2 for the questions].

## Conclusions

The resources and style of teaching used in this subject for undergraduate teacher education at the University of Melbourne allowed our students to investigate authentic issues involving IT in a school and to develop recommendations for a school. These experiences in working as a team member and being relied on to contribute, in leading a team and coordinating the process and the outcomes, and in presenting the findings to peers and staff give the students valuable opportunities to develop knowledge and skills in a way quite different to traditional university teaching styles. PBL, supported by appropriate technology and experts, has allowed our students to analyze authentic situations in a fictional school and consider alternative solutions or paths of action while working in a team. An element that strongly influenced students' experiences and learning is that students did not work on these materials alone, but rather discussed their findings with colleagues and worked as a team to arrive at conclusions. The need to reflect on observations and share with others and develop the skills required in being a successful team member will, we believe, serve our students well in becoming leaders in the rapidly changing environment of schools of the twenty first century.

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# Preparing Tomorrow's Teacher to use the Information Technology: From InTech to PalmTech

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**A curriculum based on handheld and mobile technology called PalmTech is under development to prepare preservice teachers as well as inservice teachers to use handheld technology in the classroom. Currently all preservice teachers at Albany State University must complete a technology curriculum called InTech before graduation to master their technology skills. This new PalmTech curriculum is being developed to complement and extend InTech in areas not being covered by InTech. PalmTech, despite its limitations, has the advantage of short training time, easy to use, low cost, and taping into the emerging technology. PalmTech is mainly designed to explore areas of teaching strategies not easily implemented by the traditional desktop technology.**

One of the major missions of the SOWEGA PT3 Project at Albany State University, besides technology infusion in the classroom and faculty development, is to train student teachers how to integrate technology into curriculum that they are using during the student teaching period and in the future classroom. The SOWEGA PT3 project partners with the Education Technology Training Center (ETTC) of Georgia State Data and Research Center on campus to provide every student teacher on campus intensive technology training through a vigorous program called **Int**egrating **Tech**nology (InTech). InTech is a 50-hour course originally designed for Georgia K-12 Teachers by Georgia Department of Education to retrain inservice teachers in technology skills. The SOWEGA PT3-ETTC partnership helps modify the InTech curriculum to suit the needs of student teachers in the region. In the program, student teachers apply basic technology skills into K-5, Middle, or High-School curriculum according to their specializations.

To demonstrate their competence, each student at the end of the training must produce a CD-ROM and a Website that features everything that they have done for the InTech course. Practically, the student produces an electronic portfolio that can either be carried in his/her own pocket as a business card (actually a cd-rom in the size of a business card) or can be distributed as Web pages. The e-portfolio is not part of the requirement of the original InTech curriculum; but it is becoming a standard for the pre-service students because of the collaboration. In fact, it has become a requirement for all student teachers to complete InTech training before they are eligible for graduation since the partnership started two years ago.

InTech at Albany State University was launched in 1997, since then the technology has changed rapidly; inevitably the InTech curriculum has to be modified on yearly basis to reflect the change. But the change is still largely surrounding the desktop and its peripheral technology. The recent rapid growth in handheld technology that demonstrates tremendous potential in preparing tomorrow's teachers to use the technology effectively has largely been ignored. The SOWEGA PT3 project and the ETTC Center have decided to launch a new initiative to expand the InTech curriculum to include handheld technology for training preservice teachers. Since then a curriculum called PalmTech has been developed as an attachment unit to the InTech program. Now students not only are capable of producing an e-portfolio on the Web and on cd-rom; they are also capable utilizing the information technology via handheld computing devices such as Palms and other Pocket-PCs in the classroom to enhance their teaching.

In the presentation, both InTech and PalmTech curriculum will be shared interactively. A model e-portfolio and the power of PalmTech will be showcased by one of the student teachers who has participated in one of the InTech-PalmTech courses. The potential of PalmTech will be discussed and demonstrated through interactive activities. An assessment of the student's performance and reactions to new the PalmTech curriculum will be presented.

# Moving Beyond Make Believe: On-Line Lesson Plan Collaborations

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**Abstract:** Brunswick County Public Schools (Virginia) has partnered with Old Dominion University on a collaboration project aimed at bridging the gap between pre-service university methods courses and authentic classroom environments. Instead of merely writing theoretical lesson plans, based on make-believe scenarios, individual or small teams of pre-service students from ODU are paired with a teacher in Brunswick County from a similar grade/subject level. These partners are encouraged to write a technology infused lesson plan addressing Virginia Standards of Learning. Participants communicate through an online interactive message board that is supplemented by emails and other electronic message systems. The use of electronic communications allows the site administrators and methods faculty to observe and archive the communication flow and facilitate the collaborative process.

## Introduction

In the field of education and technology, on-line collaborations are increasingly influencing instructional strategies. Through interactive web pages and e-mail, classrooms from different parts of the world can communicate with each other, work in unison on projects, and compare the results. Websites, such as iEARN (www.iearn.org), provide platforms, facilitating these inter-classroom collaborations—linking far-flung classrooms.

Teacher-to-teacher collaborations have also become prevalent components of the Internet. Early on, teachers were quick to see the value of sharing their lesson plans with others. An almost overwhelming variety of lesson plan pages have cropped up to meet the large demand of teachers (www.lessonplanz.com). List serves, such as the Teachnet site (www.teachnet.com/t2t), have become useful tools linking teachers together and allowing them to share their ideas.

In addition to list serves, e-mail, and teacher web pages, new platforms for on-line collaborations have emerged to facilitate actual asynchronous collaborations among different people. These sites allow participants to communicate in "rooms" designed for their group. In higher education, university classes use these on-line communication platforms to collaborate on course assignments.

## The Project

The current project is a unique use of on-line communication platforms, in an effort to link pre-service student teachers with in-service teachers. It responds to the trend of methods classes requiring students to write lesson plans without a particular school, class, or student population in mind. Instead of merely writing theoretical lesson plans, based on make-believe scenarios, students write lessons for a specific classroom and teacher. These lesson plans are submitted to a pre-service teacher, who actually teaches the lesson. The project uses an on-line interaction platform to facilitate communication between collaborators and encourage the use of technology.

In this collaboration, methods students from Old Dominion University are paired with a teacher in Brunswick County from a similar grade/subject level. Pre-service and in-service teachers share information on the dynamics of the in-service teacher's classroom and the two work toward a mutual lesson plan. The pre-service student submits a lesson plan to meet the needs of the students in that individual classroom. Before being passed on to the in-service teacher, the plan is checked for technology integration by the site administrators. The in-service teacher receives the lesson plan, along with any supplementary resources, and videotapes it while being taught. Afterwards, the in-service teacher uses a rubric to evaluate the performance of the lesson plan.

Copies of the video and the comments of the in-service teacher are delivered to the methods teachers, who share them with their students. Once the pre-service teacher sees the video of their lesson being taught, they evaluate their lesson according to a rubric that assesses its strengths and weaknesses.

Faculty members are free to use the tapes as they choose. Some simply hand out their videos. Others watch them in class and conduct group assessments. One, in particular, handed out the videos to their students and asked them to pick out a five-minute portion of it to share with the class. The videos are archived in the College of Education's Resource Library and may be used with future methods classes.

## Results

Fall semester 2001 was the first trial run of this project. Although it was something completely new to ODU methods faculty, students, and Brunswick teachers, it achieved an encouraging amount of success. Out of the 60 pairs of collaborators, only a few lessons did not get taught.

Methods faculty were initially somewhat apprehensive about the project. By the conclusion of the fall semester, they were overwhelmingly supportive. Aware of their role as the last trainers of these future teachers, the methods faculty were excited about the authenticity of the learning experiences. Students were exposed to a technology rich school division and a myriad of technology resources. They were mentored by veteran teachers and asked to plan with a specific audience in mind.

One problem teachers and students reported revolved around communication. Some found the message board and on-line communication too impersonal and preferred communicating over the phone. This issue is being addressed during the spring semester through an increased effort to prepare students and teachers to use the on-line communication platform.

## Conclusions

The project provides a mutually beneficial relationship for both higher education and K-12 education. Old Dominion methods courses achieve a greater depth and purpose to their lesson planning activities. Old Dominion students have reported higher levels of technology usage. Students must regularly check messages from their collaborating teacher on-line and teachers expect technology to be infused in the lesson planning process. Pre-service students get additional 'real world' mentoring. Brunswick Schools benefit from the influx of new ideas that current pre-service teachers provide through their on-line interactions and lesson plans. Armed with improved strategies and the experience of the fall semester, the lesson plan collaboration project expects to continually see more positive results, as it tries to bridge the gap between pre-service studies and in-service teaching.

# Educational Endeavors for PreK-12 Instructional Design: NASA Partnership Opportunities

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**Abstract:** National Aeronautics and Space Administration (NASA) offers educational opportunities throughout the nation and maintains educational endeavors for PreK-12 learners as well as teacher education coursework in real-world environments so as to aid the university methods faculty in the real-world uses of NASA-related subject matter and focus.

## Introduction

The integration of the National Aeronautics and Space Administration's (NASA's) real-world data and educational environments makes the curricular planning and implementation less focused upon purely theoretical matter and further focused upon the actual day-to-day understanding of difficult conceptual underpinnings of subject matter. This is of primary importance to teacher candidates, who must have such educational endeavors modeled to them as they move through the teacher education curriculum of study and before they are expected to develop curricular scope and sequences on their own.

Modeling is of primary importance within coursework, especially methods coursework for teacher candidates, as many instructors teach as they have been taught; the innovations available within today's educational arena must be focused upon in order to break free of the educational ineptitudes of years past and to refocus today's learners upon the importance of understanding theoretical matter within an environment of real-world, data-driven information environments. It is no longer a viable option to have theories available and memorized by learners; today's environment stresses the use and integration of information into understandable units that can be manipulated to glean the aspects of necessity and importance. Therefore, NASA partnership opportunities offer the real-world environment through which to maintain theoretical grounding of knowledge while reaching towards higher order thinking skills that are necessary within today's world. Teacher candidates must have opportunities to integrate the real-world data and information available through NASA into the instructional design process, so as to design and develop appropriate and successful lessons for their future learners.

## Cross-Curricular Ventures

Within the educational environment of today's PreK-12 schools, there has been a growing emphasis upon cross-curricular activities. The theoretical underpinnings that emphasize such a learning opportunity is the clear understanding that all knowledge should be introduced to the learner as a whole, instead of offering "bits and pieces" of important information that the learner must understand and integrate into the "whole" on his or her own. Further, the cross-curricular learning opportunities emphasize the appropriate and successful development of the learner's conceptual framework of understanding, which is based upon the theory of cognitive flexibility and the learning opportunities available within a cross-curricular venue. Spiro and Jeng state that, "By cognitive flexibility, we mean the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands.... This is a function of both the way knowledge is represented (e.g., along multiple rather single conceptual dimensions) and the processes that operate on those mental representations (e.g., processes of schema assembly rather than intact schema retrieval)" (1990, page 165). Additionally, cognitive flexibility "is largely concerned with transfer of knowledge and skills beyond their initial learning situation" (Kearsley, http://tip.psychology.org/spiro.html, paragraph 2).

As such, NASA's engagement within the PreK-12 educational realm supports cognitive flexibility as well as the cross-curricular development of a learner's conceptual framework. The real-world opportunities that NASA offers to the learners is envisioned as supporting mathematics, science, history, English and language arts, geography as well as numerous other subject areas of emphasis, while supporting the hands-on research of the learners. The integration of technology at every conceivable point is also a supported venture, as technology has the ability to offer real-world data sets, streaming audio and video, graphic elements, Web sites presenting useful information and other interesting aspects that were previously unavailable.

## NASA Educational World Wide Web Sites

Numerous Web sites are available through NASA's support of educational ventures within the PreK-12 arena. Such support of the young people is an area that NASA and the professionals associated with NASA have taken as their own personal opportunity to support the educational endeavors of the professional educators of the world's young people, as well as enrich the learning environments with the real-world learning opportunities that not only entertain but also meet important learning objectives. Following are merely a few of the numerous Web sites that support NASA's interest in PreK-12 education. As expected, there is a significant bent towards mathematics and science; however, other disciplines are also valuable and are integrated whenever feasible.

- Practical Uses of Math and Science: The On-line Journal of Math and Science Examples for Pre-College Education
  http://pumas.jpl.nasa.gov/
- InfoUse's PlaneMath -
  http://www.planemath.com/
- NASA Spacelink
  http://spacelink.nasa.gov/.index.html
    - Spacelink: Mission Mathematics
      http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Mathematics/Mission.Mathematics/.index.html
- The Space Place
  http://spaceplace.jpl.nasa.gov/teachers_page.htm
- NASA Human Space Flight Metric Converter
  http://www.spaceflight.nasa.gov/station/reference/calc/index.html
- NASA-AMATYC-NSF Mathematics Explorations I and II
  http://cctc.commnet.edu/la/
- NASA KIDS
  http://kids.msfc.nasa.gov/
    - How Much Would You Weigh on Another Planet?
      http://kids.msfc.nasa.gov/Puzzles/Weight.asp
    - How Old Would You Be on Another Planet?
      http://kids.msfc.nasa.gov/Puzzles/Age.asp
- LTP Glenn Learning Technologies Project
  http://www.grc.nasa.gov/WWW/K-12/airplane/index.html
- Space Science Data Operations Office of NASA/Goddard Space Flight Center: Space Science Education
  http://ssdoo.gsfc.nasa.gov/education/education_home.html
- NASA-JSC Distance Learning Outpost
  http://learningoutpost.jsc.nasa.gov/

Engineers and scientists in the field do not only support the availability of curricular experience; the inclusion and support of professional classroom educators is also an important element within each of the Web sites noted. The desire to enrich the learning experiences available within today's learning environment, as well as heightening the level of interest of young people within the fields of mathematics and science, are important elements towards the success of these programs.

## Interactive Learning Opportunities

NASA and their affiliates offer numerous interactive elements through which to enliven the learning environment of the PreK-12 classroom environment, as well as higher education endeavors at the community college and university levels. The availability of such simplistic information as a lesson plan with integrated activities, through the time-delineated interactive activities with professionals working directly with the learners are available. Following is a short explanation of merely a few opportunities available.

**World Wide Web Sites**

Web sites developed by NASA and partnering affiliates emphasize numerous points of information as well as interactive elements. For example, PUMAS (http://pumas.jpl.nasa.gov/) "is a collection of one-page examples of how math and science topics taught in K-12 classes can be used in interesting settings, including everyday life" (Kahn, paragraph 1). This site emphasizes the design and development of examples that are primarily written by scientists and engineers, so as to make available peer refereed lesson opportunities to the education profession. It is noted by Kahn that "NASA program directors and other leading representatives of the scientific community have been asking working scientists to contribute to science education" and goes on to write that "part of the motivation for these requests is to encourage and train future scientists, the emphasis has been on helping teach basic 'science literacy' to all students" (http://pumas.jpl.nasa.gov/Short_Intro.html, paragraph 4). Some examples offered in the PUMAS Web site are as follows:

- Coastal Threat: A Story in Unit Conversions
- How Now, Pythagoras?
- Just what is a logarithm, anyway?
- Square Roots Using a Carpenter's Square (http://pumas.jpl.nasa.gov/examples/titlefl0_1_1_1.htm)

For each of the activities available, the appropriate grade level(s), curricular benchmarks, and subject keywords are available, as well as the peer review timeline to ensure appropriate review of the subject matter and educational viability are met.

As well, simulation learning opportunities are available through NASA sites. One example of an innovative design is InfoUse's PlaneMath (http://www.planemath.com/), which is developed by InfoUse in cooperation with NASA. The PlaneMath Web site offers an interactive opportunity to learn mathematics and aeronautics, with an emphasis placed upon real-world style simulation activities. There is an opportunity for the students to work within the simulation atmospheres associated with the following topics:

- Applying Flying
- Pioneer Plane
- PlaneMath Enterprises

Further, the professional educator or parent has the opportunity to register their class at the Web site. Following are the opportunities available to the professional educator or parent:

- Activities for Students
- Help Me Get Started
- Links to Other Sites
- Parent/Teacher Info

Therefore, there is adequate support available through the NASA and NASA-affiliated Web sites to ensure an appropriate and successful learning opportunity.

**Real-World Data Sets**

Real-world data sets are available through different venues associated with NASA. Such real-world data sets make available opportunities for learners to take theoretical models and formulas that are usually conjecture and may be perceived as having nothing to do with the daily world of a learner's reality, and move towards a cognitively viable conceptual framework of understanding. One Web site that offers real-world data sets is the NASA-AMATYC-NSF Mathematics Explorations I and II (Capital Community College, 2000) Web site. This site is maintained for educational purposes and states "The first Project emerged from a desire to create exciting mathematics classroom materials based on NASA space activities" (Capital Community College, 2000, http://cctc.commnet.edu/lta/history.htm, paragraph 1). The original idea was to focus the project towards two-year community college courses; however, this information is just as valuable and viable within secondary classroom learning environments.

**Streaming Video and Instructional Television Interactive Sessions**

There are numerous venues through which to actively interact through interactive sessions, such as streaming video, instructional television, and videoconferencing. For example, Spacelink (http://spacelink.nasa.gov/) offers annual series of television broadcasts and streaming video broadcasts free to all educational parties. The series integrates mathematics, science and technology through educational distance learning opportunities, with grade-specific subject matter. Distance Learning Outpost, through videoconferencing, allows students to interact with NASA personal through integrated Expeditions and Challenges. Following are a few of the opportunities available, by grade range:

- NASA CONNECT
  Grades: 6-8
  Subject Matter: Mathematics, Science, Technology
  http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Mathematics/NASA.CONNECT/.index.html
- NASA-JSC Distance Learning Outpost
  Grades: K-12
  Subject Matter: Mathematics, Science, Engineering, Geography, and Technology
  http://learningoutpost.jsc.nasa.gov/
- NASA Why Files
  Grades: 3-5
  Subject Matter: None Specified
  http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Mathematics/NASA.Why.Files/.index.html
- NASA Optics
  Grades: K-12
  Subject Matter: Science, Math
  http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Mathematics/Optics/.index.html
- Taking the Measure of the Universe
  Grades: 6-12
  Subject Matter: Measurement and Computation in Mathematics
  http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Mathematics/Taking.the.Measure.of.the.Universe/.index.html

The above-mentioned Web sites are merely a few of the numerous opportunities that NASA and NASA collaborations have made possible to the education profession. Along with the broadcast element, there are also additional flyers, lesson guides and Web activities available for each session. Reviews of the available interactive sessions easily meet course objectives. As well, NASA educational endeavors can also be requested specifically for a classroom's activities and objectives.

## Meeting National Standards

Each discipline is supported by national organizations that emphasize the importance of standards at the national level. Through the association's development of national standards, there is a clear vision as to the importance of subject matter taught to teacher candidates as well as emphasized within the PreK-12 curriculum at specific levels through out the learner's progress. As an example, the National Council of Teachers of Mathematics (NCTM) has developed *Professional Standards for Teaching Mathematics* (NCTM, 1991) as well as *Principles and Standards for School Mathematics* (NCTM, 2000). Within each of these standards, at both the teacher candidate and PreK-12 learner levels, technology is a supporting factor towards the success of educational endeavors.

The "Technology Principle" is one of six principles that the National Council of Teachers of Mathematics (NCTM) designate as imperative for all teacher candidates to master (NCTM, 2000). The "Technology Principle" states that "Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning" (NCTM, http://www.nctm.org/standards/principles.htm, paragraph 28). However, it is ultimately the mathematics teachers, not the technological tools that have the ability to support the educational goals of each endeavor integrated into the curricular scope and sequence, that is the key to the success of the mathematical learning environment (Garofalo, Drier, Harper, Timmerman & Shockey, 1000; Kaput, 1992; NCTM 1991, 2000). The National Aeronautics and Space Administration (NASA) offers technological opportunities towards the support of educational endeavors and the ability to meld numerous subjects into innovative, real-world, interesting lesson opportunities for PreK-12 learners. Further, the support of NASA offers the teacher candidates opportunities towards successfully meeting NCTM's "Technology Principle" (NCTM, 2000).

## Conclusion

The integration of the National Aeronautics and Space Administration's (NASA's) real-world data and educational environments makes the curricular planning and implementation less focused upon purely theoretical matter and further focused upon the real-world understanding of difficult conceptual subject matter underpinnings. Emphasis must be placed upon links between theory and practice within all specialization areas; further, the desire to develop cross-curricular endeavors is also extremely important. NASA and their affiliates should be commended for their efforts, as well as further integration of the available resources should be implemented within teacher education coursework, PreK-12 curriculum, and higher education curriculum.

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# Coffee, kaliedescopes, roller blades, and ice cream cones: What poetic conventions tell us about teachers' relationships with and perceptions of educational technology

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**Purpose**

> *"Give me a lever, and a place to stand and I will move the earth."*
> Archimedes, 340 AD

Centuries ago, Archimedes recognized technology's power to both initiate and facilitate world altering change. Although his enduring metaphor places appropriate emphasis on the role technology plays in the change process, Archimedes' illustration fails to acknowledge that several important factors influence the speed, direction, and magnitude of efforts to bring about change.

At present, computer-based technology, is the lever of choice for many proponents of educational change. Research on efforts to improve teaching and learning with technology has revealed that several factors influence technology-driven educational change. Early research in the 1980s on the implementation of technology for the purpose of enhancing teaching and learning revealed that limited access to appropriate and adequate equipment was to largely to blame for the failure of change efforts. Once these problems were addressed researchers turned their focus to other problems. In the late 1980s and early 1990s, researchers focused on problems stemming from teachers' need for basic technical skills and various kinds of support (administrative, community, technical). Now that efforts have been made to address these aforementioned concerns, current research in the field revolves primarily around problems emanating from teachers' lack of knowledge about appropriate integration of technology. The research trend that emerges from examination patterns during the last twenty years is a movement from the investigation of technical and organizational forces influencing change to those more professional and personal forces (in humans) influencing change. If the trend continues, one might anticipate that the next realm of research will study the most fundamental human characteristics influencing efforts to change--individual beliefs and attitudes.

In other areas of educational research, teachers' beliefs and attitudes have been identified as factors critical to the success or failure of reform efforts (Fullan, 1991; Elmore, Peterson, & McCarthey, 1996; Tyack & Cuban, 1993). Although the research literature on teacher beliefs and attitudes toward innovations affecting such professional concerns as content area instruction (Battista, 1992), instructional reform (Holland, 1998), and multicultural education (Shaw, 1993) has grown dramatically in the last ten years (Richardson, 1996), a body of research investigating the effect of teachers' beliefs and attitudes on efforts to change teaching and learning using technology has not yet been developed. Information regarding the nature of teachers attitudes in regard to their relationship with technology and their beliefs about the relationship of technology and learning could be important for a variety of reasons.

This paper reports on a study exploring teachers' attitudes toward and their beliefs about the relationship between instructional technology and learning. It shares the information gained from an investigation conducted with some 26 preservice teachers participating in a semester-long technology infusion project. Teachers were asked to share their personal relationship with technology and their belief about the relationship of technology and learning using the poetic conventions of either similies or metaphors.

Information generated from this investigation revealed that teachers' attitudes toward and relationships with educational technology vary considerably. It communicates that these beliefs and attitudes are able to be influenced by participation in academic coursework and field experiences geared toward the integration of technology with instruction.

The study suggests that teachers beliefs and attitudes play a critical role in the speed, direction, and magnitude of efforts to integrate technology with instruction. It identifies concerns that might be addressed when attempting to facilitate teachers' adoption of technology in the classroom. Finally, it suggests that use of poetic convention was an effective method of inquiry for investigating teachers' beliefs and attitudes that might be used in future research projects.

**Perspectives**

Humans use poetic convention to explain objects, ideas, and relationships that often defy explanation in more simple terms. Metaphors and similes can be more economical than other manners of expression—using fewer words to paint a better picture. They enable the expression of feelings, thoughts, things, and experiences for which there are no easy words. And they are generous to readers and listeners as they encourage interpretation and further exploration.

In this study, preservice teachers were asked to use the poetic convention of similes and metaphors to describe their attitudes and beliefs about technology. This approach was employed because the researcher believed that the qualities of poetic convention mentioned above would aid teachers in recognizing their own views and sharing them with others. It was presumed that teachers might feel more comfortable using similes and metaphors than simple expression. It was also believed that teachers, who are known for their ability to be creative, might enjoy this creative approach and share more information about themselves if given the option to use descriptive language.

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**Methods and modes of inquiry**

26 third-year preservice teachers from a large state school in the northeast participated in this study during the spring of 2001. The preservice teachers had recently completed basic undergraduate coursework in the arts and sciences and some foundational courses in the field of education. These preservice teachers varied in their amount of experience with technology but had no formal training to help them develop specific skills for using technology nor experiences teaching them how to integrate technology with instruction prior to this study. Preservice teachers participated in a pre-practicum placement taking place in an elementary school classroom (grades 1-5) that was located in one of four school districts (representing rural, suburban, and urban school settings). In these placements, they were matched with an experienced teacher (with a minimum of 3 years experience) who was considered a novice with technology. The preservice teachers spent two, 6-hour, school days during a 14 week semester in their placement.

During the semester when the study was conducted, the preservice teachers participated in a two credit course called "Technology as a Tool for Instruction" offered as part of their formal courses concurrent with the pre-practicum experience. In this course, students developed skills necessary for using three popular software programs- a multimedia program called Kid Pix, a spreadsheet program called Excel, and a semantic mapping program called Kidspiration. They also received instruction helping them develop an understanding of how technology might be integrated with instruction. This instruction included opportunities to write lesson plans in which behavioral objectives were considered a condition for learning, student interaction with technology was required, and where the technological resources utilized were limited to those found in their pre-practicum classroom.

As part of their experience in this course, preservice teachers were expected to share the skills and knowledge they gained as part of the technology course with teachers in their prepracticum placements. The preservice teachers completed assignments that required them to discuss their beliefs about teaching and learning, their experiences with technology, and their understanding of technology's instructional role with the teachers with whom they worked. In addition, preservice teachers were asked to plan at least one technology integrated lesson with their partner teacher and reflect on it during the course of the semester.

The preservice and inservice teachers were brought together once at the beginning and end of the semester for brief meetings. During these meetings, all were introduced to the project, expectations for the semester, and the idea of using poetic convention to describe the power of technology. The definition of two specific poetic conventions--similes and metaphors--were shared with the group. In addition, a quotation from Archimedes using a metaphor and other examples were shared. All of the teachers were given paper and asked to develop two comparisons (either a simile or a metaphor) describing their personal relationship with technology and their perception of the relationship between teaching and learning. Teachers were then asked to share their ideas with others.

Data was analyzed using a variation of the constant comparative method (Guba & Lincoln, 1989; Strauss, 1989). After being compiled following the two meetings, it was grouped into exclusive categories that were representative of emergent themes represented by all data in each category.

**Data sources or evidence**

Some 50 similes and metaphors were collected at the beginning of the semester from 23 preservice teacher participants. An additional 55 were collected at the end of the semester from 24 preservice teacher participants. In addition to grouping the data by category, analysis was conducted to determine whether preservice teachers attitudes and beliefs were influenced over the course of the semester. An open-ended questionnaire administered to preservice teachers at the final project meeting added data to the researcher's analysis that was used for verification purposes. Students metaphors were member-checked and the categorization of data using the constant comparative method was checked by a colleague who was not involved in the project.

**Results and Conclusions**

Eight themes were generated to reflect the perception that students had of their relationship with technology. The preservice teachers described their relationships as variable, unpredictable, evolving negative, difficult but promising, overwhelming, optional, and transformational. Seven themes were generated to describe students' perception of the relationships between technology and learning. These themes reflected students perception that: 1) technology should be an essential part of the learning process, 2) that technology merely enhanced learning, 3) technology had specific and particular roles to fill in the learning process, 4) technology should be used as a reward, 5)experiences using technology were addictive for students, 6)technology was useful in learning but not a personal preference, and 7) technology leads to learning. When metaphors created at the beginning of the semester were compared with those created at the end of the semester, some evidence of change in students over the course of the semester was present. This raised interest in future research to determine the source of this change.

**Educational importance of the study**

Efforts that focus on encouraging teachers to use technology in their classroom are more likely to succeed if teachers' beliefs and attitudes are taken into consideration. This study would suggest that preservice teachers beliefs and attitudes regarding technology can be influenced by experiences they have as part of their professional preparation. This study reports on one such model for integrating technology into professional preparation that might be of use to other institutions preparing teachers. In addition, this study reveals specific attitudes and beliefs preservice teachers possess in relations to educational technology. If taken into consideration during the design of technology infusion projects, the beliefs and attitudes shared here might improve such efforts.

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# Impact of the Cognitive Apprenticeship Model on Preparing Pre-Service Teachers to Effectively Plan For the Use of Technology in Instruction

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**Abstract**: This paper is a report of the findings of a study conducted to determine if the use of the Collins-Brown-Newman (1989) Cognitive Apprenticeship model in an instructional technology course based on the Integrating Technology for Inquiry (NteQ) model (Morrison & Lowther, (2002) would positively affect the pre-service teacher's: (1) beliefs/concerns about using the computer as a tool to enhance student learning, (2) perceived ability to use technology and integrate it into the curriculum in an appropriate manner, and (3) ability to effectively design lessons that integrate technology into the elementary school classroom. Findings indicate that this approach positively affects the pre-service teacher. At the end of the study, participants indicated that they felt confident in their overall ability to (1) use and effectively integrate technology into the elementary classroom, (2) use, teach basic skills, and design a lesson that included meaningful use of database, spreadsheet, Internet, and desktop publishing, and (3) manage a learning environment, which includes multiple computers.

## Introduction

Newly certified teachers are often faced with a variety of expectations with regard to technology when entering their first teaching assignments. For example, school administrators may require them to integrate technology into instruction, parents and community members may expect them to have students use technology as it is used in the workplace, and students expect computer use to be part of their classroom activities. In order to make effective use of this technology, these beginning teachers must have the ability to use the technology resources that will be available. They must be able to design lessons that include meaningful student use of these resources, and be able to manage a learning environment that includes multiple computers. If new teachers are to meet these expectations and succeed in a technology-enhanced environment, it is imperative that they have the knowledge and skills needed to effectively use technology in an instructional setting and that they have the belief that using technology will be beneficial.

Although most teacher education programs now have at least one required course that focuses on technology, recent studies suggest that many of these courses have not been successful in preparing pre-service teachers to effectively use technology in the classroom (NCATE, 1997, Milken Exchange on Teacher Education, 1998). This lack of success is often attributed to courses that place a greater emphasis on the technology itself rather than how to use technology to enhance learning.

The current, most common model is Computer Literacy, which is more traditional and is based on a formal approach in which pre-service teachers learn to use the computer through a series of lessons and activities focused on the basics of hardware and software technology. The primary goal of this model is to produce computer literate teachers. It is assumed that once these skills have been developed, the pre-service teacher will have the competence and confidence to integrate technology into their instruction.

Unfortunately, this model does not provide pre-service teachers opportunities to see instructors modeling the use of technology like it should be used in K-12 classroom. Nor does it provide instructional strategies for the integration of technology into the curriculum, opportunities to observe technology being used by students in technology classrooms or opportunities to practice teach with technology.

As noted in the International Society for Technology in Education (ISTE) National Technological Education Standards (NETS) for Teachers (2000), graduates of teacher education programs are expected to possess a degree of instructional knowledge and skills that encompass both computer literacy and the effective integration of technology into the curriculum. The Computer Literacy model does not appear to provide the content and experience necessary for pre-service teachers to effectively use instructional technology in the classroom. Therefore, the problem becomes more of how do teacher education programs prepare teachers who can meet the growing expectations with regard to technology use in the classroom? In other words, how can the instructional technology course meet the ISTE NETS for Teachers (2000) within the current educational environment?

## The Study

The purpose of this study was to determine if the use of the Collins-Brown-Newman (1989) Cognitive Apprenticeship (CA) model in an instructional technology course based on the NTeQ model (Morrison & Lowther, 2002) would positively affect the pre-service teacher's: (1) beliefs/concerns about using the computer-as-a tool to enhance student learning, (2) perceived ability to use technology and integrate it into the curriculum in an appropriate manner, and (3) ability to effectively design lessons that integrate technology into the elementary school curriculum. The Cognitive Apprenticeship model was based on the incorporation of modeling, coaching, scaffolding, articulation, reflection and exploration into an instructional technology course. This study used these approaches in the context of effective technology integration that focused on the pre-service teacher's use of the computer to locate, process, and present information.

If the Cognitive Apprenticeship model was to prove successful in a pre-service instructional technology course, other factors needed to be considered, as suggested by the "knowledge and skills" portion of the NETS for teachers (2000). This knowledge base includes: basic computer technology operations, personal and professional use of technology, and the application of technology in instruction. In this study, the approach taken to address these competencies was the Integrating Technology for Inquiry (NTeQ) model (Morrison & Lowther, 2002). This model aligns with the Cognitive Apprenticeship model and fulfills the NETS for teachers. With regard to the use of the Cognitive Apprenticeship model in an instructional technology course, the NTeQ model provides a realistic context for learning and encourages the use of the computer-as-a-tool. Pre-service teachers learn the same computer skills that teachers are expected to use in the classroom and apply these skills to real-world activities similar to those found in a typical technology classroom.

## Method

The participants for this study were seventy-six education majors enrolled in a required undergraduate instructional technology course. The course included the following components: (1) supervised practice to learn and refine basic computer skills, (2) participation in simulated computer-based lessons where the pre-service teachers take on the role of elementary school students and the instructor models the role of the classroom teacher, (3) assisting elementary students as they use computers, and (4) collaborative and independent development of computer-based lesson plans and related student products. The course covered a broad range of computer applications: email, word processing, database, spreadsheet, Internet, desktop publishing, and multimedia presentations.

This study included one treatment (36 participants) group and one comparison (40 participants) group. Two course sections were randomly assigned to the treatment group and two were randomly assigned to the comparison group. A full cognitive apprenticeship approach, based on the Collins-Brown-Newman (1989) model, was used with the treatment group. This approach provided participants with real tasks that were typical of the conditions and contexts of a technology classroom. This group participated in three model integration lessons taught by the instructor, and a series of field experiences which included: (1) observing an elementary classroom teacher teach a technology-based lesson in a technology classroom, (2) interviewing an elementary classroom teacher who regularly integrates student use of computers into her/his instruction, (3) participating in two instructor facilitated model lessons with small groups of elementary school students, and (4) observing the implementation of a treatment group-created technology based lesson plan into an elementary school classroom.

The comparison group received a limited cognitive apprenticeship approach. Although both groups covered the same course materials and prepared the same final products, the comparison group sections were taught in a more traditional manner that involved reading about and discussing what happens in a classroom that integrates technology rather than experiencing what actually happens.

The measures for this study consisted of: (1) Pre-and Post-Stages of Concern (SoC) questionnaires, (2) Pre- and Post-Technology Needs Assessment (TNA) surveys, and a Final Lesson Plan Rubric. The SoC questionnaire is a 35-item instrument used to identify the seven stages of concern through which teachers pass when they are introduced to an innovation, such as integrating technology into the curriculum: awareness, informational, personal, management, consequence, collaboration, and refocusing. Participants rated the degree to which each item reflected her/his current concerns/beliefs using an eight-point Likert-type scale that ranged from (0) not relevant to me now to (7) very true of me now.

The TNA survey addressed the following topics: (1) background information, (2) overall level of computer ability, and (3) level of computer ability as an educator. The participants used a five-point Likert-type scale to rate her/his perceived level of computer proficiency from low (1) to high (5).

The participants were given an NTeQ (Morrison & Lowther, 2002) Final Lesson Plan template on the last day of the semester and they were instructed to design a lesson that appropriately integrated technology into the elementary school curriculum. This lesson plan was evaluated using a two-part Final Lesson Plan Rubric. The first part consisted of evaluation criteria for each of the NTeQ lesson plan components. Each lesson plan criteria was evaluated using a rating scale, (1) did not meet expectations to (5) highly exceeded expectations. The second part of the rubric assessed the overall quality of the lesson with a five-point assessment scale that ranged from (1) Poor to (5) Excellent.

## Results

To determine if the use of a cognitive apprenticeship model in an instructional technology course affected the pre-service teacher's beliefs/concerns about using the computer as a tool to enhance learning, a 2 x 2 repeated measure (Treatment vs. Comparison) analysis of variance (ANOVA) procedure was performed to compare the results of the Pre- and Post- Stages of Concern Questionnaires. The results revealed a significant difference between the treatment and comparison group's mean percentile scores for the following stages of concern: awareness and informational at a significance level of $\underline{p}<.05$.

To determine if the use of a cognitive apprenticeship model in an instructional technology course affected the pre-service teacher's perceived ability to use technology and integrate it into the curriculum in an appropriate way, a 2 x 2 repeated measures (Treatment vs. Comparison) ANOVA procedure was used to compare the results of the Pre- and Post-Technology Needs Assessment Surveys. No significance was found. Both groups' mean scores increased from pre to post in all areas.

To determine if the use of a cognitive apprenticeship model in an instructional technology course affected the pre-service teacher's ability to effectively design lessons that integrated technology into the elementary school curriculum, independent t-tests using a between subjects design were calculated for each final lesson plan component criteria and the Overall Lesson Plan Rubric. The results revealed a significant difference between the treatment and comparison group's Final Lesson Plan Rubric scores for the following lesson plan component criteria and the Overall Lesson Rubric at a significance level of $\underline{p}<.05$: (1) matching computer functions to learning objectives, (2) specifying computer application function(s) and their required manipulations, (3) describing specific computer tasks, and (4) developing evaluations that reflected the learning objectives, as well as overall quality of the lesson.

## Discussion and Conclusions

The conclusions of the study will be presented by discussing each component of the research question: Does use of the Cognitive Apprenticeship model in an instructional technology course based on the NTeQ model positively affect the pre-service teacher's:

*Beliefs/concerns about using the computer-as-a tool to enhance student learning*

At the beginning of the semester, self-concerns (awareness, informational, and personal) that dealt with the pre-service teacher's perceived ability to integrate technology into the curriculum were high for both groups. Task (management) and impact (consequence, collaboration, and refocusing) concerns were less evident. High self-concerns at the beginning of the semester are typical for nonusers who are just becoming aware of an innovation and therefore want more information about it and its consequences for them.

At the end of the semester, the treatment and comparison groups continued to have high self-concerns regarding management and impact, although the treatment group's concerns were significantly lower than the comparison group's. These results indicate that treatment group felt more comfortable in their perceived ability to integrate technology into the curriculum. Impact concerns increased for both groups suggesting that participants from both groups were becoming interested in how the use of technology in the classroom impacts students and in working with others.

*Perceived ability to use technology and integrate it into the curriculum in an appropriate manner*

The Technology Needs Assessment (TNA) Survey was given to the participants on the first and last day of the semester to assess their perceived ability to use technology and integrate it into the classroom. No significant differences were found between the treatment and comparison group's Pre- or Post-TNA mean scores, indicating that participants entered and exited the course at similar levels, however, both group's mean scores had increased in all areas from pre to post assessment. At the end of the study, the participants felt confident in their overall ability to: (1) use and effectively integrate technology into the elementary school classroom, (2) use, teach basic skills, and design a lesson that includes meaningful student use of database, spreadsheet, Internet, and desktop publishing, and (3) manage a learning environment, which includes multiple computers.

*Ability to effectively design lessons that integrate technology into the elementary school curriculum*

The results revealed a significant difference between the treatment and comparison group's ability to effectively design specific lesson plan component as well as develop an overall lesson plan that successfully integrates technology. These lesson components were: (1) matching computer functions to learning objectives, (2) specifying computer applications and their required manipulations, (3) describing specific computer tasks and, (4) developing evaluations that reflected the learning objectives.

The treatment group, in contrast to the comparison group, developed lesson plans that were more well thought out, cohesive, and based upon a meaningful and interesting problem. The learning activities within these lesson plans were age-appropriate, engaging and required multiple applications of critical thinking skills. These lessons required students to use a variety of computer applications to process data. Forms of authentic assessment were used to assess students.

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# Incorporating NETS Standards into an Elementary Certification Program

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This paper will present the design of a teacher certification program at Georgia Southern University that meets the NETS standards (the basis for the Georgia Technology Standards) for teacher certification. After an initial course that presents introductory knowledge and skills related to technology, the program area integrates into their courses applications of instructional technology. These applications include projects that:

-integrate commercial software into a classroom activity.
-use commercial software as a vehicle for total classroom problem solving in a one-computer classroom.
-use spreadsheets and software to develop mathematically sound graphs for use in the classroom.
-use digital images and presentation software programs.
-use probe ware in science instruction.
-create classroom materials stored on a CDR.
-download and store materials from the WWW for classroom instruction.
-deliver instructional units/lessons that use a variety of software, hardware and learning to support instruction.
-implement lesson that build student content knowledge and skills with the use of a variety of modern technologies.

The details of the projects and how they relate to the general content needs for certification, as well as, how they help the student meet the technology standards required for certification will be illustrated.

# Teacher Created Data Bases that Foster Scientific Literacy

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This paper will present the value of using a database to developing scientific literacy in an inquiry-based learning situation. The emphasis will be on presenting a model for developing databases for use in a K-12 classroom. Aspects of the presentation will include:

I. Science that can be developed using databases
    Help teachers provide an inquiry-based science program for their students
    Help teachers provide a classroom setting that will have the teacher as a guide and facilitator of student learning by providing the resource and questions
    The unifying concepts and Processes of Systems
    Content of life science: the characteristics of organisms; life cycles of organisms; organisms and their environments; populations and ecosystems; diversity and adaptations of organisms; behavior of organisms
    Show Students the abilities of technological design in scientific investigations
    Provide an understanding about science and technology

II. Considerations necessary for designing a database
    What information do you want to store
    What format you will retrieve information in
    Sorting features
    What population will be entering data and sorting
    Type of data, e.g. text, numerical, graphic, video, sound
    Organization of data

III. Classroom applications of databases
    Information retrieval
    Recognition of patterns and trends
    Analysis of relationships
    Testing of hypotheses
    Interpretation of data
    Critical thinking

The above issues will be illustrated with an in-depth look at eight data bases developed for use in a middle school science methods course. The content of the databases presented are: birds; plants; trees; animals; insects; fungus and marine organisms. Elements of design and classroom activities for pre- and in-service science teachers will be presented. The use of these databases in such a matter help certified teachers and public school students meet the appropriate NETS standards in a pedagogically sound manner.

# Approaching Authentic Assessment: Two professors share their methodologies.

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**Abstract:** Two professors share their methods of authentically assessing pre-service teachers. Instead of traditional midterm and end term exams, students in their classes must prove competence in real-world situations. In one class, Educational Foundations, pre-service teacher candidates participate in a simulated interview for a teaching position in which the interviewee must respond to questions and propose strategies to address current educational issues. Questions such as these are the basis for competitive interviews in New York State's school districts. In the second class, pre-service teachers (Tech Ambassadors) are partnered with P-12 teachers and must deliver researched, technology-integrated lessons to elementary students in their classrooms under faculty supervision.

## Dr. Brenda Dressler: "Interviews with depth"

Teacher education programs have always viewed assessment as significant in the training of pre-service teacher education candidates. New accreditation standards are driving the teacher education program's assessment practices to focus on what its candidates can do in terms of standards and performance. According to NCATE's Program Standards for Elementary Teacher Preparation (1999) candidates need to be evaluated by traditional assessment instruments and performance assessment instruments that are integral to instruction and aligned with the standards. Data generated can then be used to assist the individual candidate and to improve the teacher education program.

Traditionally, except for student teaching, assessment in education courses consists of tests, quizzes and research papers. Prospective teachers are now expected to implement multiple assessment measurements in their classrooms. In this paper, I share a performance assessment method, "the interview" used with pre-service teacher education candidates in Educational Foundations.

A good assessment instrument must be congruent with reality (Wiggins, 1993; McClelland,1973). Performance assessments are regarded as more realistic because they measure higher-order thinking skills rather than just accumulating knowledge (Tuchman, 1993) The pre-service teacher candidates in my class will be asked questions on the performance assessment measurement that are often asked at an interview for a teaching position. The interview performance assessment used in Educational Foundations meets many of the characteristics of an effective assessment instrument.

The following items adapted from Margaret Jorgansen, in Reflections of Learning (1992) indicate that an effective performance assessment instrument should: reflect ideal instructional practices; involve the teacher as participant-observer; require collaboration; allow investigation; are motivational; facilitate response preferences; allow multiple strategies; have multiple solutions; integrate knowledge and processes; have relevance; have topic currency; have an appropriate level of difficulty; are feasible; are cost effective and tap higher order thinking skills.

The interview process provides candidates with additional modalities to explain what they have learned (Gardner, 1991). Throughout the semester, candidates write papers on educational and philosophical issues, field experiences, critique journal articles, present oral reports and have traditional paper-and pencil midterm and final essay exams (Part II). The interview process included in the final exam ( Part I) provides an opportunity for candidates to develop a plan of action when faced with a new situation. In this assessment measurement ,the interviewer poses a "what if...scenario" and the interviewee must respond with a plan of action. This is a change in the methodology of learning from memorization of content to the potential to apply and understand knowledge and it a characteristic of an effective performance assessment (Jorgansen, 1992)

The interview performance assessment exam was developed in response to several needs: new accreditation standards in teacher education programs requires that multiple methods of assessment be used (NCATE, 1999); to create a final exam congruent with current educational issues and strategies studied in the course; to determine whether knowledge of issues and strategies can be adapted to other situations; to create a venue for pre-service teacher candidates to demonstrate orally and visually their knowledge, skills and their impact on the learning of students in their future classroom; .to create a performance exam that engages pre-service teachers to reflect on realistic, significant problems faced in the classroom and to design innovative solutions; and to prepare pre-service teachers for an interview for a teaching position and to prepare for the video tape teaching performance assessment required for permanent certification.

## The Model:

Educational Foundations, a study of major educational factors that impact on the schools is the first course in the program taken by pre-service teachers during their junior year. . The topics emphasized are social issues, school governance and finance, cultural diversity, diverse learners and learning styles, inclusion, curriculum and instruction, legal issues, global education and technology integration in the classroom. Classroom observations and attendance at a school board meeting are required. During the semester, pre-service teacher candidates are assessed using traditional and alternative assessments.

The interview questions on the performance assessment measure are congruent with the topics studied in the course. Pre-service teacher candidates are given the interview questions and the rubrics for an oral presentation seven to ten days before the scheduled exam. To prepare for this interview, candidates engage in inquiry and problem solving and then develop strategies for responses. Examples of questions posed are:

1. What if.....? (I create the scenario and then you plan how it would be resolved)
2. What are your weaknesses? (2) (Pick one weakness and explain how you would turn this around to work for you)
3. How would you handle discipline/ school violence/ conflict resolution in your classroom? (3 strategies)
4. What strategies (4) would you use to involve ESL students in your class?
5. Describe in detail a lesson that you observed indicating the objective(s), activities addressing different learning styles and evaluation.
6. What strategies (4) did you observe or would you use to teach respect for diversity?
7. Give examples (2) of how you would integrate technology into the curriculum.

The pre-service teachers are informed that they will be asked three questions and that they can select the fourth question. All pre-service teacher candidates are asked the "what if" question and needed to respond with an analysis of the situation and a solution. The researcher designs a variety of situations such as "What would you do if a student arrives late to class?" or "What would you do if the student did not partipate in discussions?" Candidates complete an evaluation form on the interview process. After the exam is completed, the tapes are duplicated and the pre-service teacher candidate receives the original tape which can then be used for reflection and self-evaluation along with the rubric.

In summary, the interview performance assessment measurement has been administered for two semesters. The classroom settings were very different for each semester. In the first semester, two separate classes received the interview assessment with the instructor present. In the second semester, the class was located in three distance learning rooms on three different campuses with three different people administering the exams. The instructor interacted with the candidates and sometimes asked additional questions. The other proctors did not interact with the candidates in this way. Most candidates performed very well although some were uncomfortable with being filmed. In conclusion, the interview performance assessment measurement needs to generate more data to be evaluated.

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## Joanne Clemente: TechAmbassadors –Authentic Assessment of Teaching Abilities

"Few teachers (20%) report feeling well prepared to integrate educational technology into classroom instruction." Thus states a report by the Department of Education entitled, Teacher Quality: A Report on the Preparation and Qualifications of Public School Teachers. Additional study by the Milliken Exchange shows that "Most institutions report that IT is available in the K-12 classrooms where student teachers get their field experience; however, most student teachers do not routinely use technology during field experience and do not work under master teachers and supervisors who can advise them on IT use." It further concludes that, "the most important finding of the survey is that formal stand-alone IT coursework does not correlate well with scores on items dealing with technology skills and the ability to integrate IT into teaching." The report recommends:

- "Student teachers need more opportunities to apply IT during field experiences under qualified supervision"
- "In order to provide models for change, researchers, professional societies, and education agencies should-on an ongoing basis-identify, study and disseminate examples of effective technology integration that reflect the current needs in both teacher education and K-12 schools." (Moursund, 1998)

In addition, a 1997 NCATE task force on technology in teacher education report found that "teachers-in-training are provided instruction in 'computer literacy' and are shown examples of computer software, but they rarely are required to apply technology in their courses..."(NCATE, 1997.) Some schools such as Southwest Texas State University have initiated programs that require assessment of pre-service teachers in the use of technology in their field based experiences in public schools. The initiative I describe, the TechAmbassador program, is the first step toward providing such experiences in the undergraduate teacher training program at New York Institute of Technology.

## The Model

This paper is a report from the field to describe the outcomes of a second semester of the TechAmbassador Project. In the first year of the project, pre-service teachers were placed in several P-12 school districts in partnership with in-service teachers for the purpose of technology integration in the partner's classroom. Pre-service teachers attended a class on the college campus entitled, "Curriculum Articulation and Multi-Media" for which 20 hours of field experience was required. The initiative was enthusiastically received and executed, and further development was a natural consequence. In the second iteration, it was decided to limit the placement of pre-service teachers to one school and to convene the undergraduate class at the school itself (field-based methods course). More control over the environment, more convenient supervision and a closer relationship with in-service teachers was anticipated. However, permission to relocate the undergraduate class was not received from the college in time for the beginning of the semester. Adjustments were then made to conduct the college class on campus, as usual, and allow each student to complete their field experience at the selected school at a time when both in-service and pre-service teachers were available for collaboration.

At the start of the semester, as the professor teaching the course, I introduced the project to in-service teachers at the elementary school and explained the collaborative process. Teachers were enthusiastic about receiving TechAmbassadors, and enrollment had to be limited. However, there were some underlying issues that both helped and hindered this pilot project throughout the study that bear mentioning. While the computer lab in this school was brand new, the computers and the Internet connection were not. They were ported from an old location in the school and not well tested with the installed software. This network set-up had not been used very much for the two previous years, since the district made the unpopular decision to eliminate the only "Tech Teacher" position. In retaliation, the teachers at this school had been boycotting the lab. The principal at this school was instrumental in convincing the teachers that this TechAmbassador initiative would provide assistance for teachers while allowing them to maintain their position to district administrators that a "Tech Teacher" was an essential component for technology integration. Putting pre-service teachers into this troubled situation to "teach with technology" and assist these teachers thus became more challenging than anticipated for all concerned. First, the in-service teachers had very high expectations. They believed that since our college was an Institute of Technology, our pre-service teachers would be technology "experts" and able to trouble-shoot any hardware/software problems that arose. Some in-service teachers even expected the pre-service teachers to take students into the lab weekly. While our students may have had more experience than most college students, they were still only "students" and as such, needed more training in pedagogy, technology integration and classroom management. The purpose of this initiative was to enable a partnership that would provide such training for both student and teacher. In the end, the pre-service teachers were indeed very proud of themselves. They had been placed in "real" situations, faced with political, technological and pedagogical challenges, and rose nicely to the occasion. This was not a sterile, "college classroom" environment; rather, it was a real world experience with real problems, curricula and students to reconcile.

Some students had a difficult time with this format. Two students stand out in particular. One of these started out enthusiastically, feeling overly confident in her abilities to manage a class and integrate technology. This student did not prove to have the follow-through to carry lessons to completion and finished with poor evaluations. On the other hand, a student who started his observations rather late in the semester was threatened with being dropped from the course. Not only did he rally and truly commit himself to deliver exemplary lessons, he later wrote in his research paper, "This was a wonderful experience for me and I learned so much about getting ready to teach a lesson. I can now see that teaching does not just end in the classroom. Some lessons take lots of prep work before it can be taught. This class really showed me that teaching is what I truly love, and I can't wait to one day have my own class." This student was later asked by the principal to submit a resume for a future position. Another student produced two exemplary lessons, using Internet research and cooperative learning groups. What distinguished her work was her ability to calm the teacher who became frazzled when the computers were not functioning properly and later, her ability to refocus her lesson within ten minutes when her partner teacher did not have the class learn the appropriate background material as previously promised. Some students and teachers worked so well together. One teacher, in particular, gave students curricular material with which to work. This material happened to have contained web site suggestions, upon which my TechAmbassador built a lesson. She writes, "Research is the key aspect in writing a lesson. If the research is off, the lesson has the opportunity to fall apart." Since this in-service teacher was being treated for cancer and was absent more than once a week, the two partners developed a reciprocal and mutually beneficial relationship. The TechAmbassador says in her paper, "She has such great rapport with the students, they respond, respect and listen to her with their ears and minds wide open. Being in her class, I have learned so much. Everything she does with the students, she explains to me, how and why she did what she did. Seeing her teach makes me even more eager than I already am to become a teacher. I hope I am half as good as she is and that I can inspire someone like she has inspired me."

Within the course, I attempted to follow a pre-determined protocol. First, the pre-service teachers were sent to observe teachers in their normal environments. Each TechAmbassador had a partner teacher and visited the classroom for a least one hour a week to observe, participate, or assist as deemed appropriate by the host teachers. As mentioned above, each partnership took on different characteristics and some flexibility was needed. Some students merely observed quietly, while others attempted to take classes into the lab at the teachers' requests. Each week, in the college classroom, these students would discuss their experiences, learn how to develop technology-enriched lessons, practice new technology skills and prepare their upcoming lessons. Two "delivered" lessons were required in this course; one at mid semester and the other at the end of the term. Each lesson needed to be discussed in class, researched, planned using the NTEQ format developed by Morrison and Lowther. Through observations, assisting, researching and practicing, pre-service teachers prepared throughout the semester for these two benchmark performances. The purpose of such planning was not only to deliver technology enriched curriculum-based lessons, but to provide the in-service teachers with two well-documented, turn-key lesson plans for later use. This collaboration not only served as professional development inside the classroom but it allowed pre-service teachers to be authentically assessed by college faculty as to their understanding of and competence in meeting curricular needs. So, in this project, instead of taking midterms or end terms, students (pre-service teachers) received performance assessments of the lessons delivered in "host" classrooms (lab).

A rubric was developed by students together with me, the professor, to evaluate the performance of their two technology-enriched lessons. These rubrics were then used by students for developing their lessons, self-evaluations and professor-evaluations. Grades were based on adherence to rubric criteria, taking into consideration any circumstances beyond the students' control, i.e. lab inconsistencies. Criteria for evaluation included preparedness, enthusiasm, content knowledge, use of technology, classroom management, attire, speaking and listening skills, grammar and clarity, teacher interaction, and the quality and thoroughness of the lesson plan. These are criteria expected of a true professional. The rubric allowed students to think of themselves and their planned lessons in the light of professional performance, in terms that ranged from speaking skills and attire to technological and pedagogical competence. Lessons delivered that exemplified the integration of technology included: map skills using the Internet for research and Kid Pix for re-creation of map highlights; continent study utilizing Hyperstudio to create a mulit-media slide show; document based questions (on the Internet) used to study Native American culture; and Point of View writing using an Internet-based scenario and the Student Writing Center.

Flexibility often became a hallmark of this initiative. Students were challenged by circumstances and sometimes even the most practiced lesson did not proceed precisely as planned due to network configuration problems. At mid-term time, I was willing to participate in the lesson, helping the TechAmbassador to deliver a lesson; at end-term time, however, I participated to a much lesser extent and was less lenient on evaluation. While my objective was to fairly evaluate my students' performances, as a professional, I believed it was also essential to prioritize P-12 student learning. Thus, if P-12 students needed assistance, I provided it within reasonable parameters. Most P12 students were actively and consistently engaged in the technology enriched lessons and looked forward to their computer lab time.

Pre-service teachers were also asked to submit several papers throughout the semester. From the first day, I referred to them as colleagues, as teachers with responsibilities to me, their partner teacher and to the P-12 students. They were initiated into the teaching profession by having to lead a class discussion on an assigned book chapter. They were evaluated on their summary of the content as well as their development of open-ended discussion questions based on the chapter readings. I was encouraging them to take a leadership role. In addition, they were asked to document their observations in their partner teachers' classrooms, reviewing teaching styles, students' behaviors and curricular goals. A journal of their weekly experiences was also collected for evaluation. These are perhaps traditional evaluations by college course standards. What distinguished the measure of their true learning as teachers was the authentic assessment of their teaching ability. This was done through the use of the rubric to evaluate the technology-enriched mid-term and end-term lessons.

In summary, pre-service teachers were provided an opportunity to enter a real classroom setting and integrate technology into the curriculum through well prepared, researched and delivered lessons. They not only experienced students behaviors but teacher conflicts and technology lab inconsistencies. I don't believe I could have provided a more realistic setting for authentic assessment of their abilities.

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# VYGOSKIAN VIEWPOINT:
# TECHNOLOGY and CONSTRUCTIVISM

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## Abstract

Views about constructivism in the classroom are varied and at times misleading. Ideas about integrating technology in to the curriculum are also varied and at times misleading. The authors present a clearer vision of the use of constructivism in the English, Math, Science, and Social Studies classroom by meshing Vygotsky's ideas about constructivism with the use of technology as a tool for learning.

## Technology and Constructivism

Views of constructivism in the classroom are varied and at times misleading. Ideas about integrating technology into the curriculum are also varied and at times misleading. A clearer vision of the use of constructivism in the classroom by meshing Vygotsky's ideas about constructivism with the use of technology as a tool for learning is needed.

There are various views of constructivism - including: trivial, radical, socio/ cultural, critical and constructionism. The aspects of socio/cultural constructivism as seen through the writings of Lev Vygotsky will be addressed in this paper. The authors believe that by studying constructivism from this viewpoint the reader will get a clear view of this one perspective as it relates to the use of technology across the curriculum. The authors have future plans to study and report on other views of constructivism in relation to the use of technology in the learning environment.

The ideas presented in this paper reflect the use of technology to "infomate" not "automate" the learning process, such as: concept mapping, problem-based learning (including webquests), asynchronous communication (including email, discussion boards, and collaborative writing), selected database and spreadsheet activities, desktop publishing opportunities, and the use of the internet. Ideas for integration of constructivist technological learning environments in the English, Math and Social Studies classroom will constitute the remainder of this paper. Examples of these ideas, as well as those for the Science classroom will be an integral part of the poster session.

## The Social Studies Constructivist Classroom

A marriage of socio-cultural view of constructivism with technology opens up myriad opportunities for students to develop ideas and construct meaning through social interaction facilitated by technology. In the absence of such a theory of learning, teachers often rely solely on textbooks to provide information, which has been processed, for students. Students are not constructing the knowledge for themselves.

Technology-mediated learning, however, offers opportunities far beyond the classroom walls for communication, collaboration, research, and publishing. With the textbook and curriculum guide as resources, a teacher can facilitate the learning process, which might begin with exploration of a topic and end with creation of a product, perhaps a web site or Power Point presentation. In the process, students guide their own learning, working their way through various internet sites that afford opportunities for interaction with actual social scientists (i.e. Africaquest, Greecequest, etc.), on-line discussion, problem-solving situations, virtual tours of places throughout the world, access to on-line libraries and data-bases, and even competitions and quizzes. Three of the many web sites offering incredibly diverse on-line projects are www.classroom.com, www.execpc.com and www.cssjournal.com. With imagination and desire, a teacher can whet the learning appetite of students who have previously been fed only dry textbook food.

## The Mathematics Constructivist Classroom

Opportunities exist in mathematics for young children to discover important mathematics ideas using technology, in the context of shared experiences and development of terminology. LOGO, the programming language for creating designs using geometric transformations, can be the medium by which elementary children discover these transformations and use them to create tessellations. Children can also explore combining two or more transformations of one variety that accomplish the work of one transformation of another variety. Such activity can be used later as a model for composition of functions. Students can be encouraged to name the different transformations and to attempt to identify and name the types of tessellations that can be created.

Opportunities exist for secondary mathematics students to discover how "parent" functions are affected by systematic modifications in values of x before substitution, and modifications in values of the function after substitution. Using a graphing calculator, students can discover systematic effects of these modifications, and can learn to describe and classify them using terminology not normally associated with mathematics. The process can be reversed, with each student posing a graph for other students in a small group, and other students attempting to describe the equation of the given graph, by first describing parent-function modifications with the agreed-on terminology.

## The English/Language Arts Constructivist Classroom

Vocabulary development is a central objective in every language arts classroom, K-12. Traditionally, students read and listen to words and definitions selected and provided by their teachers.

In a social-constructivist classroom where the teacher has infused technology into the teaching and learning environment, students collectively identify words they consider important and relevant from within their own life experience. These words may emerge from a number of sources, such as live conversation, television (video), movies, video games, web sites, e-mail, and a variety of print media. Then students construct an understanding of each word's meaning and appropriate use beginning by discussing what they already know about the words and the context within which they have encountered the words before. Students then mediate their personal understanding of these words by investigating ways the words are used and defined by others. This often begins by comparing published definitions from a variety of sources, including electronic databases. Students then seek a broader understanding about how the words might be used. One approach to understanding how words are used outside the students' daily discourse is the "find" function found in most text readers and editors. Students participate in an ongoing collaborative negotiation of meaning, sharing and challenging each other's understanding of the words as they emerge and evolve. Students then demonstrate an understanding of the words in authentic contexts, both spoken and written. This demonstration may be facilitated by technology in the form of electronic presentation, word processing, communication, and publishing. Students learn not only vocabulary in this process. They concurrently negotiate the value and use of various information and communication technologies. Technology is made available as a resource (much like dictionaries, textbooks, and the chalk board) to be used by the students as they solve problems, seek information and understanding, and find ways to apply what they have learned in ways that are both personally and socially meaningful. Teachers in such a classroom act as coaches and guides — mediating disputes, giving approval, and establishing the social framework within which the learning occurs.

Lev Vygotsky forwarded the notion that higher mental functions (the way we understand things – all things) are mediated (modified, limited, or enabled) by language. Thus it behooves students to work to construct their learning in a socio-cultural environment. The authors believe that this environment needs to be infused with the use of technology as a tool to help construct that learning.

# Examining the Value of Technology in Creating and Assessing Narrative Pedagogy in Teacher Education

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## Abstract

This panel presents a set of practices which can be described as "technology enhanced narrative pedagogy". The presentations explore the ways in which combining technology with narrative practices in teaching and teacher education has proven valuable in helping:

- preservice and inservice teachers to identify, share, and extend their understanding of teaching and learning
- teacher educators to evaluate their practice and develop increasingly effective ways of meeting the needs of diverse learners

The practices will be described in sufficient detail so that others can participate in judging their validity for educating both pre-service and in-service teachers, as well as for self-study.

The presentations thus address two important issues:

- ways in which to create effective "technology - enhanced narrative teaching practices" that are useful in teaching and teacher education
- ways in which to create forums in which such practices can be rigorously interrogated for their value as well as their validity in the professional education of teachers and the self-study of teacher educators

## Educational Importance

The use of technology enhanced narrative practice provides many as yet untapped opportunities for the conduct of research that is deeply relevant to teaching and teacher education. It provides access to diverse contexts and insight into the ways in which teaching and teacher education is situated in these contexts(Putnam & Borko, 2000). In this way, it facilitates the sharing of experiences and development of common understanding.

Narrative teaching practices have advanced because of the careful scrutiny and self-study of practitioners. New technologies can support and document such scrutiny.
The technology enhanced practices documented by these presenters and the dialogue generated by the presentations will create new forums for understanding and defining effective practices in teaching and teacher education.

## Format: Interactive Panel

This interactive panel will be comprised of a series of presentations by teacher educators in the fields of special education, early childhood and elementary education, bilingual education, educational leadership , and reading and literacy. These presentations will describe the process and outcomes of a project designed to foster increased use of technology by and for teachers and teacher educators. Particular emphasis is paid to diverse uses of "technology enhanced narrative pedagogy" including: digital video case materials, e-mail journaling, web based discussion forums and digital portfolio. Each presentation will address a common set of questions:

- How did the use of technology facilitate the implementation of narrative research and/or narrative teaching?
- How did technology support the learning process of the teachers and teacher educators involved?
- What unexpected problems surfaced?

After a brief presentation by each participant, the discussion will be opened to the floor. The audience will be encouraged to comment on the practices described and/ or share their own experiences. Dialogue will focus on the validity and usefulness of technology enhanced narrative practice in teacher education and professional development

## Presentations

### Increasing the Use of Technology in Teaching and Teacher Education

Our programs in teacher education and leadership have been working since 1997 to integrate new technologies and pedagogy in ways that prepare teachers to work in diverse and inclusive classrooms. To do this, teacher educators, themselves, needed to become more comfortable with the possibilities technology offered for extending teaching and learning. With support from private funders (Project EXPERT) and the federal government (Project DEEP), a program of technology based professional development for teacher educators was developed. Approximately 85% of our faculty now use new technologies in their work at the college, and 35 of our teacher education courses have had their syllabi, assignments and readings infused with technology-rich resources.

While this work has been very successful it has not been without significant resistance.
In this presentation, we will examine to what degree faculty participation in the projects has nurtured interest, overcome resistance, and led to achievement of both individual goals and projects goals .Data collected from peer review discussions, observations, and final project reports suggest that 2 factors have been central to the project's success:

- A carefully constructed cultural match - The identification of relevant connections between the uses of technology enhanced pedagogy and the institution's core values
- The role of the outside evaluators. - "Critical friends" who helped shape the project by listening to and questioning both project leaders and project participants.

**Using Digital Video as a Tool for Advising and Rethinking the Teacher/Adviser (Supervisor)/Researcher Relationship**

This paper presents a year-long study in which nine teachers from West Harlem in New York City were videotaped as part of a federally funded grant designed to prepare general education teachers serve the needs of English Language Learners. Digital video was used as a tool to help teachers narrate and reflect on their practices. In this presentation, we ask the question: Is technology-enhanced narrative pedagogy a feasible tool for stimulating teacher growth?

**E-Journaling: Examining Intensity and Efficacy in Advisement (Supervision)Relationships**

The reflective journal - sometimes expanded to "dialogue journal" - is a time-honored practice of educators who value student voice and increased student-teacher interaction. This presentation will report on how Journaling through e-mail has significantly altered the nature of many of those interactions. The ease and immediacy of narrative reporting - and response - bring the potential of far greater intensity and efficacy to the dialogues – and the possibility of substantial distortion as well.

**Web Based Discussion Groups: A New Lens for Examining Practice**

This presentation will focus on the experience of one teacher educator as she engaged in a two year process of learning to use web-based discussion groups in graduate courses and staff development. Particular attention will be paid to the impact of this experience on the teaching of a graduate course in child development. Information that surfaced from the discussion groups led to changes in the content and structure of course assignments.

**Digital Portfolio: Teachers and Teacher Educators Learning Together**

This presentation reports on the collaboration of a teacher educator and a educational technologist in advising a graduate student in the process of constructing a digital portfolio that narrates her understanding of and competency in teacher education. Particular attention is paid to the ways in which each participant learned from the others throughout the process.

The many drafts of artifacts and captions replete with comments that led to the construction of the portfolio which can be viewed at
http://www.edc.org/CCT/BSC/work-bin/jsuesse/pmap.htm provide a rich data source.

**Evaluators as "Critical Friends": Identifying and Supporting Promising Practices**

This presentation will identify the ways in which the role of "Outside Evaluator" informed both the practice of those being evaluated and-that-of-the-evaluator-herself. By extending the dialogue around the "narrative teaching practices", both insiders and outsiders were able to raise questions of the value and validity that surround these practices. These questions include:

- Are these technology enhanced narrative practices congruent with philosophy and practices across the institution?
- In what ways does the presence or absence of congruence impact on the value of the practice?
- What implications does the congruence have for replicating these practices in diverse contexts?

# The Teaching Observatory Concept: Embedding Zones of Interactive Technology into Teacher Education & Research Programmes

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**Abstract**

**This short paper presents research in progress into the concept of a Teaching Observatory (TO) currently linking two sites but soon to expand to a national network. The TO set out to create a flexible multi-modal and multi-purpose interactive training tool for a post-graduate teacher education course (PGCE). The university site and sites in 'beacon' secondary schools are linked via a 6 ISDN large screen video facility with pan/zoom cameras and interactive whiteboards. Funded through the national Training School Initiative (DfES 2000), the TO project initially aimed to explore how an interactive training tool might be used effectively to enhance learning and teaching at different levels. It was soon evident that the TO offered many more inter-connected opportunities for pre- and in-service education and research than had originally been conceived. Set within a sociocultural framework, this case study explores and evaluates how different strands (zones) of the research can be woven together to inform the dynamic of an emerging TO concept.**

## Introduction to and uses of the Teaching Observatory

The TO concept had its origins in a pragmatic need for over 60 trainee teachers specialising in immersion/bilingual education (geography, history and science through French/German) and modern languages (especially German, Japanese and Russian) to have school-based experiences which could not be provided within the locality of the university of Nottingham, UK. It also intended to involve trainees in statutory ICT applications through the authentic use of technologies to enhance their own training experiences and thus prepare them well for incorporating a range of new technologies into their future teaching repertoire. In the initial phase of the project the university site, along with a beacon secondary school with a *section bilingue* near London, were equipped according to defined specifications (in consultation with Promethean, UK ). During the initial experimental phase of the project, the TO has been/is being used for non-intrusive lesson observations in real time of expert teachers in their classes by large groups of trainee teachers; individual remote support by tutors and observations of lessons taught by trainees during their teaching practice; sharing interactive whiteboard applications between the two sites eg trainees creating electronic teaching materials; trainees experimenting with and teaching lessons to school students at a distance; interactions with learners and teachers by the trainees to discuss lessons and issues; teachers participating in mentor training via the TO; meetings between teachers, tutors and technicians; observation and research into *strategic* classrooms focussing on a target class of French learners and a similar class for German; using video recorded lessons to create training materials; observation and analysis of the use of the TO by a team of researchers investigating Fitness-for-Purpose for the Information Society Technologies Programme Eye-to-Eye project; exploring the use of *activote* machines by students to encourage the development of thinking skills as well as experimenting with interactive whiteboards to enhance literacy awareness.

## Adopting a theoretical framework for investigating the Teaching Observatory

In order to classify and organise the different uses of the TO into a coherent research context, a sociocultural framework was adopted. Sociocultural theory supports a context-based communicative perspective on learning and teaching which foregrounds two crucial elements: learning though communication and the need for scaffolded environments to assist in co-constructing and negotiating meaning (McLoughlin & Oliver 1998). For technology to encourage and support interaction – a concept central to the TO - then building on the notion of collaborative learning and co-constructed understanding elevates the zone of proximal development (ZPD) to a pivotal position (Vygotsky 1978). The ZPD suggests that learning (through, with and from the TO) is a co-ordinated activity with all participants (expert and novice) responsible for solving problems. However, in this context it could also be argued that in some TO activities all participants are relatively novice since the TO constantly presents them with situations and problems never previously encountered. In other TO activity the roles of expert and novice are more clearly defined. The multifaceted nature of the TO therefore suggests that there are several sub-zones or strands which interrelate and interact to co-construct a cohesive ZPD. Common to all strands is the TO technology and its evaluation in terms of possibilities and limitations as a tool as well as a contributor to the scaffolded collaborative context it helps create. The strands are identified as follows: strand 1 - trainees and trainer/tutors; strand 2 – trainees and teachers in school; strand 3 – teachers and trainer/tutors; strand 4 – trainees and students in school; strand 5 – researchers and trainer/tutors; strand 6 – technicians/technology suppliers and trainer/tutors. The concept of the TO is thus being researched through the six component strands of its ZPD.

## Case studies: researching six ZPD strands in the Teaching Observatory

The complexity of different strands and ensuing research demands lends the current work to a case study approach (Cohen, Manion & Morrison 2000). The table sets out parameters of the case study research:

| Strand | Activity/Interaction in ZPD | Case Study Focus: Use of Technology in.... | Data Collection Methods |
|---|---|---|---|
| 1: Trainees/ Trainers | Observations lessons by tutor of trainee teaching face to face<br>Creating lesson plans and materials | Effectiveness of lesson observation at a distance including pre and post lesson discussion/analysis<br>Creating and evaluating electronic resources | Video recordings/ Analysis<br>Tutor field notes/diary<br>Trainee focus groups |
| 2. Trainees/ Teachers | Observations of expert lessons, post-lesson discussion<br>Trainees teaching at a distance | Developing observation, analytical and reflective skills<br>Awareness raising of skills needed to be effective 'distance' teacher<br>Evaluating the distance teaching experience | Video recordings/ Analysis/ Field notes<br>Trainee Focus groups<br>Collating/evaluating materials |
| 3. Teachers/ Trainers | Systematic lesson Observations investigate teaching strategies | Enabling systematic non-instrusive observ<br>Creating protocols for lesson observations<br>Identifying effective teacher strategies<br>Feedback to teachers to affect praxis | Cycle of observations<br>Video recordings to create analysis/feedback & training materials |
| 4. Trainees/ Students | Email communication | Fostering mutual mentoring/buddies<br>Target exchange of emails | Target groups trainees/ students & questionnaires |
| 5. Researchers/ Trainers | Observation & evaluation of TO use | Evaluating fitness for purpose<br>Evaluating the tool | Video recordings<br>Meetings/Reflection<br>Ref i2i project |
| 6. Trainers/ technologists | Technological development/support | Monitoring/evaluating whiteboard<br>Enhancing targetted sound (for group /pair work) and use of activote | Field notes/ virtual meetings/training sessions/ reports |

## Interim reflections

The data collected so far is rich and complex – it touches on a variety of paradigms and methods. Whilst it is too early to publish outcomes, results thus far indicate that different uses of the TO will meet with differing degrees of success (Crook 1994, Hearnshaw 2000). All those involved are inextricably engaged in learning and reflection in the ZPD, since the nature of the work has provided all players with new experiences including the highs of innovation and the lows of frustration or disappointment. What is certain is that the TO is opening up complex new ways of re-conceptualising teacher education by extending its potential ZPD through the use of technology which supports quality interaction and collaborative learning (Jacobs & Rodgers 1997, Laurillard 1993).

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# Views From Within an Online Learning Environment: Perceptions and Practices in a Teacher Education Course

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**Abstract:** This paper presents findings of a study conducted on a graduate level Teacher Education course. Perceptions and practices within an online environment were explored and examined. Using a framework focusing on issues and trends in public education, graduate students engaged in online dialog, action research, and teleresearch. Findings indicate that the patterns of online use and teleresearch among participants encouraged the same practices in the K-12 environment and provided a model for technology use for teachers and students.

## Introduction

Due to the demands of a dynamic, digital-savvy student body, the average teacher employed by a U.S. school system in many cases is required to infuse technology into classroom instruction. The average teacher educator typically is not required to take advantage of available technology. This can be somewhat attributed to the concept of academic freedom and in part to the fact that—although working within the teacher preparation environment—many university professors view the process of teaching and learning much differently than the K-12 teacher. Therefore in many cases unless the teacher educator is technology-oriented and forward thinking, technology is not fully utilized in typical classroom sessions. Jackson (1995) suggests that this is due to the fact that many university professors conceive of teaching as a well-organized syllabus supported by clear, logical, teacher-directed presentations. Educators at any level must remember, however, that teaching has value only if it promotes student learning. This learning must include conceptual growth, working collaboratively, and communicating. In addition, the main focus of teaching and learning must shift from content presentation to a combined, dynamic focus of how students approach learning, multiple styles of delivery, and ongoing inquiry (Jackson and Prosser, 1989; Ramsden, 1992).

Just as public school teachers must become conscious of: a) the technologically-literate student body, b) the intricate process of teaching and learning, c) the diverse learning needs of students, and d) multiple methods of delivery, the university professor preparing future teachers must also consider these factors when designing learning experiences. In the forward to The National Educational Technology Standards for Teachers (NETS, ISTE, 2000), the authors state that the educational system in the United States must produce technology capable kids—those who can live, learn, and work successfully in an increasingly complex and information-rich society. To do this, all educators must themselves be:

1. Capable information technology users,
2. Information seekers, analyzers, and evaluators,
3. Problem solvers and decision makers,
4. Creative and effective users of productivity tools,
5. Communicators, collaborators, publishers, and producers, and
6. Informed, responsible, and contributing citizens.

The NETS (2000) publication suggests that certain conditions must be present in order for the goals to be met. Included in the general preparation of teachers, university leaders must share a vision for technology use in all appropriate preservice and content courses. They must have access to current technologies—including software and telecommunications networks. Teacher education faculty members must engage in interactive sessions with colleagues to discuss, model, and design appropriate uses for technology. Last, teacher educators must incorporate student-centered approaches to learning and assessment. While technology is rapidly opening up more and more possibilities for students entering the education profession, little research has been conducted on the benefits of online learning and the development and effectiveness of the online university environment. Examining the work of Papert (1996) and Tapscott (1998) regarding technology utilization within the K-12 environment, prior research generates several questions regarding online learning within the teacher preparation environment such as: a) would the learning styles and preferences enrolled in a graduate level teacher education course be met via an online version of the course, b) would the environment invite and nurture in-depth discussion and inquiry typically part of an education issues course, c) would K-12 classroom technology experience assist with completing course assignments and requirements, and d) would technological literacy—if any—gained from the experience assist the classroom teacher as well as the future teacher in better utilizing the resources and technology for their own students' inquiry and learning experiences?

### Project Description and Methodology

The study utilized these initial questions to examine, document, and provide a thick and dense description of how graduate students—both licensed teachers and future teachers—operated within an inquiry-based, technology-infused online learning environment via a course designed and offered using the CourseInfo online development program. Using a qualitative approach outlined by Bogdan and Biklen (1992), the researcher became a participant observer in conducting eight case studies consisting of students enrolled in a core education course and who were seeking either state licensure and/or the Masters of Education degree in Curriculum and Instruction. The self-selected sample represented those teaching in rural, urban, and suburban environments, those who were substitute teachers in local public schools, and those who were not yet teaching in a professional education environment. Each individual student completed inquiry-based readings and assignments, engaged in online discussions with each other, and conducted action research at local public schools by utilizing the components available through CourseInfo. These components included: a) Announcements Board, b) Course Documents which included handouts, articles, and online resources, c) Assignments Board, d) Online Discussion Board, e) Student Tools which included email links, online grade access and Student Drop Box, and f) External Links—additional Internet links to supplement textbook reading assignments.

Data sets were collected through student products; coded virtual field notes gleaned from student email, student-generated questions regarding selected topics in education, and asynchronous online discussion board postings; results and finding s from individual action research projects; research papers; and online course evaluation forms. The researcher engaged in prolonged engagement over a one-semester period during a spring semester. In addition to data collected by the researcher, the CourseInfo package provided additional information by way of generated reports to chart frequency of use, number of accesses per day/time/hour, and frequency and number of responses to Discussion Board topics. The study was driven by the following questions, which provided a framework for data collection in addition to providing the researcher with a set of overarching inquiry themes:

1. Would levels of technological literacy hinder or assist students in completing assignments, participating in asynchronous discussions, accessing documents, utilizing Internet resources, and exchanging products with the instructor and with each other and would these levels become evident in the patterns of student use and preferences that may emerge throughout the study?
2. Will inquiry-based action research assignments and requirements assist students in making connections between course content, relevant education issues, technology utilization, and their own immediate or future classroom teaching?
3. Would the online environment provided by CourseInfo compliment course content while providing an alternative learning environment for students and how will the findings from the study impact future course development and current practices in teacher preparation?

4. How will participation in the online course and technological literacy gained from the experience impact and assist the classroom teacher as well as the future teacher in utilizing resources and technology for their own students' inquiry and learning experiences?

### Findings and Conclusions

Egon Guba (1978) describes qualitative research as a "discovery-oriented" process that minimizes investigator manipulation of data and setting and which places no prior constraints on what the outcomes of the research will be. This description became evident on the first of two on-site meetings held for orientation purposes in order to acquaint participants with CourseInfo online software and its components. It was during the first on-site meeting that participants expressed a strong desire to explore the online learning environment as an alternative to typical on-site graduate education, seminar-based courses. At the beginning of the semester, a total of ten students were registered for the course. The ten enrollees attended the first orientation meeting. However, after approximately one hour, two of the original ten decided that they did not possess a level of technological literacy they felt would be required to complete assignments. Ultimately, the two participants dropped the course opting to take it during a semester when it would be offered in a traditional manner. This focus on technological literacy and prior "computer-based" experience continued throughout the study and was often a source of participant-to-participant discussion.

In an attempt to offer insights into the milieu, general findings are presented in the chronological order in which they occurred. Data collection began at the initial orientation meeting where participants completed a demographic survey. This information enabled the researcher to begin building a "participant profile" of each student enrolled in the course. Data gleaned from the survey provided a brief explanation of where the participant was employed, what type of school system—if any—each taught in, years of experience, available technology, and the approximate physical distance from campus that participants would be working from (Table 1).

Table 1. Overview of Student Participants—Participant Profiles

| Participant | Current Occupation | Yrs. Exp. | Technology | Distance |
|---|---|---|---|---|
| 1 – CL<br>Male | Middle School Teacher<br>Social Studies/Suburban | 3 | PC/WIN 95 | 35 miles |
| 2 – LA<br>Female | High School Teacher<br>Biology/Rural | 2 | PC/WIN 98 | 67 miles |
| 3 – ST<br>Female | Elementary School Teacher<br>Grade 1/Urban | 6 | PC/WIN 98 | 45 miles |
| 4 – JU<br>Female | High School Teacher<br>Geography/Suburban | 27 | PC/WIN 95 | 70 miles |
| 5 – GI<br>Female | Middle School Teacher<br>Math/Suburban | 9 | PC/WIN 95 | 7 miles |
| 6 – GL<br>Female | Substitute Teacher<br>K-12/Rural | 0 | PC/WIN 95 | 80 miles |
| 7 – JA<br>Male | Substitute Teacher<br>K-12/Rural | 0 | PC/WIN 95 | 78 miles |
| 8 – JE<br>Female | Graduate Student | 0 | MAC | 5 miles |

In addition to the demographic survey, sample products were gathered on a weekly basis. Assignments, informational handouts, related readings, Internet resources, and themes for discussion were posted each Tuesday and were due on the following Tuesday. Assignments consisted of approximately three to four research-related mini papers, bi-monthly action research projects, reflections of weekly readings, and Discussion Board postings. Discussion Board postings were checked by the researcher on a daily basis. Participant postings and responses were printed and coded. Results from all action research projects were printed, copied, and summarized. Themes corresponded to weekly readings and enabled participants to further explore topics and exchange multiple perspectives with each other. Each participant selected an education issue to explore throughout the course of the semester. Three assignments related to the theme were due on the last day of the semester. The assignments consisted of: a) research paper, b) presentation of findings, and c) annotated bibliography. Study participants completed a summative Online Course Evaluation, which focused on their perceptions of the online learning environment, course content and assignments, and instructor-as-mediator effectiveness. Evaluation responses were examined, analyzed, and summarized. To further substantiate findings, reports were generated using CourseInfo Course Statistics to chart user preferences, frequency, and total number of accesses per participant and per component.

As participants worked through course assignments, it became evident that several of the education issues and themes were of high importance while others were of little or no importance. For example, Discussion Board postings focusing on equity and/or disparity in public school funding across the state as well as the nation ranked as most important with a total of 83 postings—including initial and follow-up responses. Throughout this particular discussion, participants referenced current problems that they were personally facing with regard to funding as well as the funding issue currently in debate within the state. Online discussion focusing on school integration issues was of equal importance to students. Participant #3, who at the time was employed by a large urban school system, related what was happening with school integration, problems with the magnet program, and school bussing issues which further provided a relevant description of urban problems to those participants teaching in rural areas. The experiences brought to the online Discussion Board assisted in connecting the reading assignments to current problems in public schools. The board postings also provided a non-threatening open-ended arena for exploration. Figure 1 provides an example of discussion.

**Current Forum:** **Integration Issues**
**Author:** Participant #3
**Subject:** Task 4.1

I teach a self-contained class of 20 first graders.
African Americans = 19 students
African American/White = 1
Females = 12
Males = 8

The racial population of my class is typical of the rest of the school. I have more females in my class than many of the other classes. My school has been rezoned as of this year. I don't anticipate any changes in our population unless we are given the needed funds to enhance our school as a Design Center and attract a more diverse group of students. The students are still bussed, but results remain the same.

**Current Forum:** Integration Issues – Response to Questions
**Author:** Participant #6
**Subject:** Re: Task 4.1

Dear Participant #3,
How much rezoning can take place when the white population of Metro is so small? There aren't enough white students to go around. The only solution to integration is to integrate the entire student populat ion of Davidson County. Is integration the answer to the learning problems of students in Metro? Or must Metro look into other ways to improve the education of inner-city students? It might be the case that separate but equal will become the norm again. However, this "equal" will mean equal learning opportunities, but separate in inner-city schools.

**Figure 1:** Example of Discussion Board Dialog

Responses gathered from the summative evaluation indicate that all participants viewed web-related teleresearch assignments as most relevant and significantly useful. In addition, utilization of additional materials—web-related documents posted in Course Documents and online articles—were perceived as significantly useful in completeing future graduate courses. Although the action research projects were cited as the assignments that assisted in connecting the content with real-world education issues, only five of the eight participants cited these projects as most useful to them in their current teaching situation. The five who cited the projects as most useful were already teaching in a public school.

The study offered students an opportunity to experience an alternative to typical on-site teacher education courses. The online learning environment matched course content, action research, and Internet utilization while empowering teachers and future teachers to take charge of their own learning via self-pacing and preferences. Referring back to the overarching questions, the level of technological literacy that each participant possessed at the onset of the project seemed to provide the self-confidence needed to successfully complete the course. Based on responses, the inquiry-based design of the course matched with the online components assisted students in making a connection between textbook material, classroom experiences, and relevant issues currently of importance to public school educators. Although products, postings, and related assignments indicate that participants displayed a broad knowledge-base regarding issues relevant to education, it seems as though the design of the assignments and the nature of the action research process provided a means for increasing this depth. Responses from on-site as well as individual email inquiries to the instructor reveal that the inquiry-based nature of the assignments broadened knowledge and that the online environment provided a scaffold for increasing this knowledge. As participants accessed their assignments from their own classrooms, the process acted as a catalyst for public school students' discussions regarding online learning. The success of the online course prompted a further investigation of other courses contained in the departmental Masters' programs as possible courses for online development.

If educators must meet the needs of their digital-savvy students in the K-12 classroom setting, they must be able to utilize technology in a meaningful, relevant manner. The challenge of training and nurturing highly qualified, technologically literate teachers falls on the shoulders of teacher educators. If they do not embrace the challenge, the education system will continue to fall short in meeting the needs of a dynamic student body. By incorporating inquiry-based tasks, ongoing discussion and dialog, teleresearch, and classroom action research into the online learning environment, the teacher educator can create an enriching alternative to typical coursework.

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## The Design of a Supportive Faculty Development Model:
## The Integration of Technology Within the University Faculty's Teacher Candidate Coursework

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Abstract: The desire to integrate technology within the PreK-12 educational environment is a noble endeavor and may lead to the enhancement of student achievement. Teacher candidates are constantly striving to understand the learning environment and to meet these expectations, but do not have models from which they may glean appropriate knowledge, conceptual and instructional frameworking. The integration of instructional technology within the methods coursework aids the teacher candidates through a model of appropriate technology integration within a classroom environment, as well as further enhances their own achievement.

### Introduction

The integration of technology within a learning environment, especially significant within a methods course for teacher candidates, emphasizes the significance of a student-centered focus. However, many methods university faculty have not had the opportunity to research the integration of technology at any significant length. This session offers methods faculty the opportunity to work with an instructional technologist who specializes in the integration of technology within a learning environment, to discuss and analyze significant elements associated with the integration of technology within a learning environment, and to critically consider the beginnings of a technology integration action plan for teacher candidate methods courses.

### Information Versus Instruction

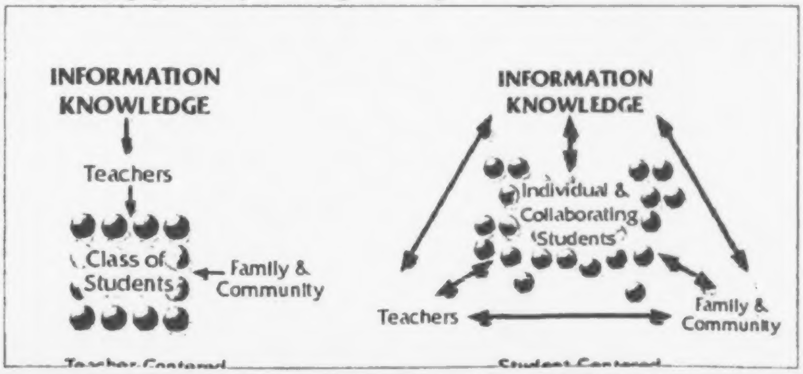
Information is a term referenced when discussing the knowledge communicated or received concerning a particular fact or situation; however, instruction is a term referenced when discussing the particular, deliberate composition of learning situation and environment that have been specifically formulated to support the realization of the learning objective or goal. Through this clearly delineated formulation towards the support of instruction is the opportunity towards the integration of instructional technology as a tool towards this instructional accomplishment.

### Instructional Technology: A Definition

Instructional technology has been defined numerous ways, but the final delineation of instructional technology is towards the successful support of the learning goals for each delineated lesson. The Association for Educational Communications and Technology (AECT) has adopted the following definition of instructional technology: "Instructional Technology is the theory and practice of design, development, utilization, management and evaluation of processes and resources for learning" (Seels & Richey, 1994). Through consideration of this definition, a clear understanding of the roles and processes pertaining to instructional technology can and may appropriately occur within an educational environment.

### Teacher-Centered Versus Learner-Centered Learning Environments

Models of instruction are important elements towards a clear understanding of the philosophical and conceptual theoretical underpinnings within the learning environment. For this reason two main emphases, related to the structure of the learning environment and the information interrelated to such an arrangement is situated within such an environment, are noted; the teacher-centered model of instruction and the student-centered model of instruction. Below is a graphic clearly delineating the two significant models of instruction.



As both models of instruction are imperative towards successful learning environments, the significant shift between the two is of a philosophical nature. Instructional technology is an important element within both learning environments, as the interactive element of the technology may be integrated in a teacher-centered or a student-centered situation.

### Levels of World Wide Web Integration

As the World Wide Web (Web) becomes a more important element towards the creation and manipulation of learning environments, it follows that the Web will be integrated into the learning environment at numerous levels. Following are ten levels of Web integration:

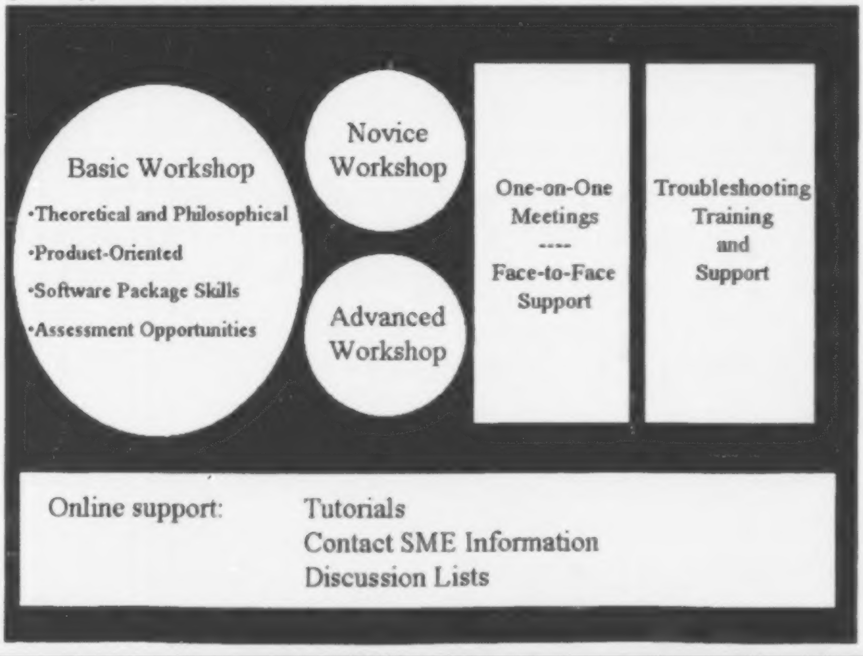
| | |
|---|---|
| Level 1 | Marketing/Syllabi via the Web |
| Level 2 | Student Exploration of Web Resources |
| Level 3 | Student Generated Resources Published on Web |
| Level 4 | Course Resources on Web |
| Level 5 | Substantive and Graded Web Activities |
| Level 6 | Electronic Conferencing Course Activities Extending Beyond Class |
| Level 7 | Repurpose Web Resources |
| Level 8 | Web as an Alternative Delivery System for Resident Students |
| Level 9 | Entire Course on the Web for Students Located Anywhere |
| Level 10 | Course Fits Within Larger Programmatic Web Initiative |

(Bonk, Cummings, Hara, Fischler & Lee, 2001)

Each level delineates the level of integration of Web resources, which in turn impacts the learning environment and the model of instruction implemented within the learning environment.

### Professional Development Opportunities Model

An appropriate model towards the appropriate and successful implementation of professional development opportunities for university faculty must be delineated so as to support the university faculty's efforts towards the integration of instructional technology into the university coursework. Further, teacher candidates must have instructional technology appropriately modeled for them within their methods courses so as to develop a conceptual framework of understanding within specific specialization areas. As such, the following model for professional development opportunities is offered.


Basic Workshop
•Theoretical and Philosophical
•Product-Oriented
•Software Package Skills
•Assessment Opportunities
Novice Workshop
Advanced Workshop
One-on-One Meetings
----
Face-to-Face Support
Troubleshooting Training and Support
Online support:
Tutorials
Contact SME Information
Discussion Lists

Each professional development opportunity follows the model graphically delineated above. An introductory, basic workshop is offered to university faculty that is based upon a specific subject. Once the attendees have attended the basic workshop, then they have the option to attend a novice workshop that is actually the basic workshop in a smaller group setting, or an advanced workshop that delves further into the subject matter from the basic workshop opportunity. Additional support is necessary through one-on-one, face-to-face support meetings, as well as hardware and software troubleshooting training and support. While each of the professional development opportunities are occurring, there is a level of online support that should remain an undercurrent, consistently available to the university faculty, that consists of tutorials, subject matter experts that are available for support and information, as well as discussion lists wherein the university faculty can discuss issues from the professional development opportunities and to develop a sense of community. That the university faculty are not, in fact, alone trying to integrate the instructional technology into their courses. Additionally, the online support further enables the conceptual framework development of the university faculty.

### Learning Environment Interactive Activities

As university faculty delve further into the integration of instructional technology within the teacher candidate coursework, there are specific aspects that must be considered within the learning environments. The following interactive activities are important within any learning environment, whether it be face-to-face, Web-enhanced or Web-based:

- Learner – Content
- Learner – Interface
- Learner – Instructor
- Learner – Learner
- Learner – Self
- Learner – Community
- Instructor – Community
- Instructor – Content
- Instructor – Interface
- Instructor – Self

Each of the interactive activities should be carefully considered through out the instructional design of the coursework and appropriately integrated so as to ensure the successful and appropriate attainment of the course, as well as unit, objectives.

### Faculty Resistance

University faculty have time-honored traditions associated with their instructional practices and there is the possibility that faculty may not find the technological innovations to be appropriate within their course learning environment. However, there is the possibility that university faculty may find it an uncomfortable proposition to consider the introduction of instructional technology into their coursework's instructional design. Fear factors are apparent and real for numerous persons who have the opportunity to integrate technology into their instruction. For example, the following factors may have an impact upon the integration of instructional technology. The fears associated with:

- change
- time commitment
- appearing incompetent
- inadequate instructional technology knowledge base
- technological lingo
- technological failure
- not knowing where to begin
- having to move backward to go forward
- reprisals (Rutherford & Grana, 1995)

are real and clear for numerous university faculty. These can not be overemphasized and must be carefully and delicately managed so as to ensure the university faculty will consider further implementation of instructional technology into the teacher candidate's methods coursework.

**Faculty Implementation Barriers**

As is well known, opportunities towards professional development opportunities have at least a few implementation barriers. Following are a few university faculty implementation barriers that offer obstacles for consideration.

- Specialization more important than technology
- Lack of knowledge and support personnel
    - Hardware
    - Software
- Time commitment
- Difficulty maintaining subject matter currency
- Technology integration viewed as risky
- Frustration surrounding technology use (Roberts & Ferris, 1994)

Each of these implementation barriers should be considered before professional development opportunities are offered, as the significant impact each aspect offers can not be overemphasized.

**Reward Faculty Efforts**

Rewarding university faculty efforts towards the integration of instructional technology into the teacher candidate methods coursework so as to model the appropriate and successful implementation of instructional technology into the specialization areas takes time and effort on the part of the faculty. Therefore, consideration towards faculty efforts and reward structures may be appropriate. Following are some areas of consideration:

- Displays of Admiration for Innovative Efforts
- Time Drain Compensation
- Positive Tenure Review Impact
- Incentive Programs
    - Interest
    - Motivation
- Financial Support
    - Hardware
    - Software
    - Course Buy-Out

The element of time is an important aspect for all university faculty due to the teaching, research and service triad of obligation and interest for each university faculty member. There are four main groups of university faculty who must be addressed through out the integration of instructional technology into the university coursework venture. The groups of faculty to address are:

- Early Innovators
- Cautious Innovators
- Hangers-On
- Negative Nay Sayers

Acknowledgement of the university faculty member's efforts also impacts not only the faculty implementing the instructional technology efforts within the methods coursework, but also the university faculty who are carefully considering the time and efforts towards integrating instructional technology into their courses. Positive efforts should be admired and rewarded at every opportunity.

**Conclusion**

The design, development and implementation of a supportive faculty development model is of utmost importance to the teacher candidates graduating from each teacher preparation unit. The integration of technology within the university faculty's teacher candidate coursework should be carefully considered and implemented with a clear understanding of goals and expected outcomes over a series of supportive professional development opportunities. The longitudinal study of university faculty progress is of utmost importance towards the further understanding and consideration of instructional technology, its integration and implementation within the teacher candidate's plan of study.

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# Integrating computer technology into classroom learning: A comparative study of the perceptions of prospective principals and teacher credential candidates

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**Abstract:** Both teachers and principals act as critical decision-makers as to whether or not computer technology is implemented in classroom learning. Yet, there is a limited amount of literature that examines, concurrently, teachers' and principals' frequency of use and confidence levels for a given productivity software, as well as their expectations for the integration of that software into classroom learning. This pilot study is an initial attempt to focus upon the above criteria to sketch a baseline profile for both teacher credential candidates and prospective principals to delineate the following: 1) to the extent that frequency of use of a given productivity software influences personal confidence level when using that software, 2) to the extent that a teacher's personal confidence level influences the probability that a given productivity software will be utilized in classroom learning, and 3) to the extent that a principal's personal confidence level influences a professional expectation of teachers to use a given productivity software in classroom instruction.

## Using TrackStar to create standards-based modules

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Dimensions of electronic learning for enhancing choral music rehearsals and choral music education courses include web-based rehearsal notes and links, web forms, electronic portfolio assessment, audio and video files, discussion boards, and electronic collaboration.

For the past three years, (fall 1999, 2000, and 2001) pre-service teachers in a choral music methods class at the University of Kansas engaged in a project designed to ascertain the feasibility of teaching teachers to develop electronic learning resources. A particular focus of the project was to design electronic learning experiences in conjunction with the National Standards for Music Education and specific examples of choral literature suitable for school choral ensembles. Specifically, the project sought to gauge the effectiveness of using models or templates that could readily be adapted for use with various real-life contexts and objectives.

In total, six fifty-minute class periods were devoted to the project, including brainstorming ideas, constructing the modules, and sharing the finished products. In 2001, "TrackStar" was used for the first time. Developed by HPR-TEC, TrackStar is a tool that assists users to create a "track," a composite work based on other people's original online creations. Benefits of using TrackStar include its ease of use--users can create a track in approximately 20 minutes. The design of TrackStar is such that users can access the material online, or via a convenient printable format. Further, TrackStar includes an automated link-checker that periodically checks Track links and e-mails authors with a list of broken links.

The purpose of the current project, then, is to evaluate the benefits of using a pre-programmed tool to assist students in developing their standards-based modules to ascertain if the tool further aids students to feel comfortable with designing their web-based work.

## Integrating Technology into the Study of Teaching and Learning

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***Introduction:***

In a report released September 1998, the US Department of Education reported, "Only one in five teachers… felt 'very well' prepared to work in a modern classroom. Specifically only about 20% said they were confident using modern technology or in working with students from diverse background." The focus of this study was to attempt to integrate technology into the study of Human Learning and Development. Data were collected across three semesters and at three separate university settings. As part of their course in Learning and Development, students explored the application of learning developmental theories to assessment of students' cognitive, social, emotional, and motivational needs as well as individual differences in learning. Furthermore, throughout the course pre-service teachers had opportunities to practice evaluating and developing instructional methods and materials to meet the group and individual needs of their students. The purpose of this paper is to describe attempts by the first author to:

1) Integrate technology-based instructional strategies into a pre-service teacher education course on educational psychology and child development,
2) To explore from a psychological perspective students' resistance to change in attitudes and behaviors toward technology,
3) To describe the impact of integrating technology, specifically on-line dialogue, on pre-service teachers' beliefs about technology, their interest and engagement in the course, and their mastery of course material.

It is important to note that my[1] experience and knowledge of *how* to integrate educational technology is limited to my understanding of potential social and cognitive factors that may underlie technology use (Eagley & Chaikin, 1993; Pintrich & Schunk, 1996; Guzzetti & Hynd, 1998). As a researcher of motivation and social relationships in the classroom, I have often observed teachers using videos, computers in their classroom, or computer lab-time as motivational rewards. Held over students like a carrots, teachers would grant or deny access to technology in order to encourage different social and intellectual behaviors in the classroom. As with most reward structures, students responded to the reinforcement but with certain costs to their motivation to learn and their relationship with their teacher (Kohn, 1993; Pintrich & Schunk, 1996). In my own classroom, I hoped to provide my pre-service teaching students with an alternative model for how to used technology in their classrooms. Specifically, I incorporated media into instructional presentations, utilized computer resources to increase access to course information and to design presentation tools, and integrated journaling activities with the electronic bulletin board (WEBCT) hoping to create an extended dialogue about and critique of the material. From a pedagogical perspective, I was the most interested in the on-line dialogue because I believed it would provide students with opportunities to engage in the co-construction of knowledge about learning and development.

***Preliminary Findings:***

As we suspected, students who became actively engaged in the on-line dialogue, posting and reading frequently, tended to report increased interest and knowledge of educational psychology, increased mastery of concepts, and tended to exhibit higher performance on the test. If you consider the frequency of reading and posting a reflection of students' engagement in the on-line dialogue, we found students who attended class regularly were the most engaged in the on-line dialogue. Furthermore, students who frequently read their classmates' submissions were more likely to continue to be engaged throughout the end of the semester. In additionally, we found frequent reading at the midterm was the best predictor of students' final examination grade and final grade in the course. What is interesting is that students' frequency of posting on-line did not predict performance on either exam. Regarding students' perceptions of the WEBCT at the midterm and end of semester, we found students' who perceived the WEBCT as helpful were more likely to report increased interest in the course, increased knowledge of educational psychology, and were more likely to be engaged in the online dialogue (both reading and posting). Furthermore, students who actively read their classmates' ideas, were more likely to report increased interest in the course and increased knowledge about the material. Lastly, students who frequently posted and read items on the WEBCT reported the activity helped them to master concepts in the class.[2] To our disappointment, however, analysis of students' self-evaluations revealed students who held negative views of technology (low efficacy, low value) resisted becoming engaged in the dialogue more than was "required." Additionally, while many students saw "value" to the activity conducted on-line (journals), they did not see the value of the communication and co-

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[1] "I" refers to the first author.

[2] Correlations were statistically significant and in the moderate ($r_{(66)}$=.30-.35) range.

construction of knowledge that occurred as a result of public discourse, nor did engagement with technology shape their views about effective means of teaching and learning.

***Discussion:***

These findings parallel those of Shallert, Reed, Dodson, Benton, Boardman, Amador, Coward, and Beth, (2001) as well as Burniske & Monke (2001). Across both programs of research, findings suggest the implementation of technology (e.g. using an on-line dialogue) is not enough to encourage meaningful engagement with and integration of technology in the classroom. Likewise, findings suggest students exhibit resistance towards change in their beliefs about and usage of technology. Findings across the Shallert et al. (2001), Burniske and Monke (2001), and my own data led us to ask: What factors shape psychological engagement in technology (Ferdig & Weiland, under review)? How can we get students to become invested, or committed to technologies used in the classroom that encourage public discourse (e.g. on-line discussions, electronic portfolios) (Burniske & Monke, 2001; Pintrich & Schunk, 2001)? How do we encourage lasting change in beliefs about the use, utility, and value of technology for the teaching and learning (Eagley & Chaikin, 1993; Guzzetti & Hynd, 1998)? The purpose of this paper will be to synthesize data across three semesters of technology implementation in a pre-service teacher-education course, to look across findings and examine sources of students' "resistance" to become engaged in on-line dialogue from a psychological perspective, and to describe the impact of technology implementation on pre-service teachers' achievement, engagement, and mastery of course material.

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# Using Computer Based Modules to Prepare Pre-service Teachers for Future Learning in the School Classroom

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**Abstract:** In the context of computer based modular design, we are currently investigating ways to bridge the gap between the university and the school classroom for pre-service elementary teachers. We have developed two authentic web-based cases in which pre-service teachers can investigate the process of supporting students' learning of significant mathematical ideas. In this paper we report on the results from our first pilot of the web-based modules in a master's level advanced teaching of elementary mathematics methodology course.

Mathematics methods courses should do more than try to inform future teachers about content and pedagogy. As teacher educators, we have a responsibility to prepare pre-service teachers for a career of future learning as classroom teachers. In the context of computer based modular design (Brophy, 2000), we are currently investigating ways to bridge this gap between the university and the school classroom.

In order to support the development of our students' identities as teachers whose focus is on the challenges they will encounter in school classrooms rather than as university students whose primary concern is to achieve adequate grades, we delineated four overarching goals for our pre-service elementary mathematics methods course. The first of these goals is that pre-service teachers will learn to make pedagogical decisions that are justified by focusing on students' thinking. In other words, students' reasoning should be at the center of teachers' decision making. The second goal is for the pre-service teachers to reconceptualize content of the elementary mathematics curriculum in terms of relationships between quantities. This goal is important as the future teachers have developed the belief that mathematics consists of rules for manipulating symbols as a consequence of their own experiences as students in school and in university mathematics courses. In contrast, we want them to come to view numbers not as mere symbols but as measures of an amount of some quantity. The third goal is for the pre-service teachers to both appreciate the importance of and learn to use coherent curricula composed of long-term instructional sequences that aim at significant mathematical ideas. The fourth goal is for the pre-service teachers to perceive teaching as a knowledge generating activity where they adapt, test, and refine instructional ideas and innovations that have been developed by others and have proven effective elsewhere. We attempt to achieve these goals by using what might be termed an emergent approach to teacher education (cf. Gravemeijer et al., 2000). In this approach, we develop conjectures about the pre-service teachers' interpretations, arguments, and strategies when we design instructional activities with the intention of building on their contributions to achieve the goals of the course.

The technological tools we have developed to support the future teachers' learning consist of two authentic web-based cases in which they can investigate the process of supporting students' learning of significant mathematical ideas. These modules each comprise a series of challenges for future teachers to explore. The *Patterning and Partitioning* module focuses on an instructional sequence that was taught in a first grade classroom over a five-week period and includes video-recordings of classroom episodes and of pre- and post-interviews conducted with the students. The goal of instruction in these lessons was to enable the students to develop a relatively deep understanding of elementary number concepts, with an emphasis on relationships between numbers up to 20. The second module, *Investigations in Teaching Geometry*, covers a three-day instructional sequence taught in a fifth grade classroom that focuses on informal explorations of volume. The challenges in this module allow future teachers to investigate both the various ways in which the fifth graders interpreted and solved the problems posed, and the role of the teacher in

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supporting and guiding her students' mathematical development. In the course, we coordinated the use of these modules with message board discussions (Bringelson and Carey, 2000). The use of the message board allowed the students to continue discussions initiated in class sessions as well as to debate new ideas that emerged.

The design of these modules is founded on a "challenge based" learning environment (Bransford, Brown, and Cocking, 1999; Brophy, 2000; Schwarz, Brophy, Lin, and Bransford, 1999; Schwartz, Lin, Brophy, and Bransford, 1999). Brophy (2000) defines modules as the combination of challenges and learning activities.

> A course using modular design divides up its content into learning activities that target specific concepts germane to that domain. Based on cognitive research, one effective instructional method is to anchor specific domain content around challenges that exemplify the utility of that content. The challenges will be the entry point into a series of learning activities designed to help students explore the concepts related to that challenge (p. 2).

Each of the modules begins with a brief overview to give the future teachers an idea of the mathematical topic being addressed together with background information about the students and the instructional setting. In the first challenge, we ask the pre-service teachers to identify essential aspects of the mathematical concepts being addressed and to speculate about what they think students will already know and what they can learn about the concept. By asking the pre-service teachers to make their thinking explicit, we gain insight into their suppositions and assumptions about learning and teaching is this particular content area. In addition, the pre-service teachers' initial thoughts serve as a benchmark that can support reflection and self-assessment (Schwartz, Brophy, Lin, & Bransford, 1999). Against this background, the pre-service teachers then tackle challenges based on short video-clips taken from classroom episodes or student interviews. In the *Patterns and Partitioning* module, for example, they compare representative excerpts from pre- and post-interviews of the same children. As the shift in the students' thinking is quite significant, they are intrigued about what brought about this change. This interest serves to motivate their engagement in the major challenge of the module in which they work in groups to investigate different aspects of the classroom during the five weeks of instruction. These aspects include mathematical tasks, classroom discourse, the role of mathematical tools, classroom norms, students' thinking, planning for instruction, and role of the teacher. For each aspect, the students have access to resources to support their investigation, assess their progress, and publish their final analysis online. Each group also presents its findings during a class session as preparation for the final challenge of the module in which the future teachers step back to investigate how the various aspects of the classroom that they have investigated relate to each other. In this challenge, the papers that they have published serve as the primary resource.

We have recently finished our first pilot of the web-based modules in a master's level advanced teaching of elementary mathematics methodology course. Overall, the feedback that we received from the future teachers in the form of surveys, message board postings, and class discussions has been positive and informative. Many of the future teachers indicated that they were initially skeptical about the value of the message board but came to appreciate this additional forum for discussion. After the completion of each module, the future teachers completed a survey to help us improve the modules and message board. The surveys asked the future teachers to focus on the modules as a means of supporting their learning and included the following questions:

1. As you have completed the challenges and engaged in the associated discussions on the message board, what are the most important things you have learned?
2. What problems and issues relating to the teaching of mathematics became important to you as you completed the challenges?
3. How could the Patterning and Partitioning/Investigations in Teaching Geometry module or the way that it was used in this class be improved?
4. To what extent did you find either set of modules to be repetitious after completing each? (This question was included on the second questionnaire.)

The issues that emerged from the surveys, message board discussions, and in-class feedback were relatively consistent. The future teachers commented that they were able to gain a relatively cohesive sense of how to sequence instructional activities. Equally importantly, they reported developing an appreciation for the importance of conceptualizing content in terms of quantities and their relationships, how to understand, assess, and support students' learning, being able to recognize in action the contrast between instrumental and relational understanding, and simply, making mathematics meaningful for all students. The following two observations are representative of the general thrust of the future teachers' comments:

> "The most value [to me] was the concrete set of lesson sequences which we went through in the class. Most of my other teaching and learning classes seemed to have glossed over the actual content and methods of teaching. This class gave me a good understanding of how to understand and teach numeracy, place value, geometry, and fractions." (J.D.)

> "The modules [specifically, geometry] provided a model teacher who was able to learn what students were thinking by asking the simple question, why? She explored the rationale behind both correct and incorrect answers, which helped her know their understandings, and sent a message to the students that everyone's thoughts were valued, not just students' right answers. Through asking about student thinking, the teacher also discovered that students took alternative paths to the right answer. As the teacher gained a better understanding of the students' thinking, she was then able to tailor her future instruction." (E.M.)

The future teachers also commented on the usefulness of the message board to continue discussions that would otherwise have been curtailed due to the time constraints of class sessions. As we have noted, the message board was used not only to continue in-class discussions, but also as a location for posting initial thoughts and assignments within the modules. The future teachers indicated that they felt comfortable communicating with fellow students on the message board. In addition, they appreciated knowing that their peers were dealing with similar issues as this made it easier for them to verbalize their thoughts about topics and concerns that arose from in-class discussions, readings, and assignments. It would therefore appear that the platform of the message board was relatively unobtrusive in allowing the future teachers to pose questions and receive constructive comments from one another between class sessions. These exchanges were also valuable to us in that they enabled us to develop insights regarding the future teachers' understandings as we monitored our progress in achieving the goals we had established for the course. We were able to document the extent to which they were developing an increased awareness of a teacher's ongoing decision making, ways of adjusting lessons, and the diversity of students' thinking and the process of their learning. Chat room facilities were included with the message board, but the future teachers did not take advantage of this opportunity. However, several commented that they wished the instructors had encouraged them to use this resource for communicating with each other more strongly.

The feedback we received about ways to improve the modules and how they could be used in future courses was substantial and constructive. A number of the students commented on the technical difficulties that they encountered, especially when attempting to access the modules from off campus locations. This was due to the limited bandwidth that some of them used to access the large amount of video included as a resource on each module. We made efforts to eliminate such technical problems during the course by providing each future teacher a CD ROM of each module so that they could view the video without accessing the website.

In addition to commenting on these technical difficulties, a significant number of future teachers indicated that they would have increased both the frequency and length of in-class discussions of their responses to the challenges. This suggests that the supplemental message board discussions were not, by themselves, adequate. Several of the future teachers also made observations about what they regarded as the limited range of video available as a resource. They wanted additional video-clips that captured the students' and teacher's perspectives on classroom events, as well as more examples of students' activity in the classroom. In regards to the last survey question that asked them about repetition between the two modules, the future teachers stated that they felt that several topics of discussion did overlap and that the major challenges in the two modules should be adjusted accordingly. The majority of the future teachers also volunteered that they had experienced difficulties in writing a group paper. However, from our perspective, this group challenge is justified with the reality of writing and publishing in any field, especially teaching. The future teachers' feedback therefore indicates that we need to consider developing additional resources to support collaborative writing.

Finally, several of the future teachers suggested reversing the order of the modules. We introduced *Patterning and Partitioning* before *Investigations in Teaching Geometry* due to grade level considerations. However, the future teachers said that both the shorter length of the instructional sequence covered in *Geometry* module and its mathematical content would have made their introduction to the use of modules and to instruction that focuses on students' thinking easier.

As is the case in any innovation or design change, we have developed conjectures about ways to improve or adjust the sequencing of instructional activities. As we reflect upon the course and revisit both the nature of the instructional activities and their sequencing, we have many changes to consider. As a consequence of using the modules, we found it impossible to focus on the specifics of teaching in as many mathematical contact areas as when we have previously taught the course. However, this limitation is, in our judgment, more than counterbalanced by a number of positive developments that we observed earlier in the semester than in previous iterations of the course. In particular, the students seemed to approach the activities in the course as future teachers rather than university students far earlier than we had witnessed previously. In addition, they moved quickly beyond the discovery/direct teaching dichotomy and developed a shared agenda that involved a strong sense of themselves as change agents. Our students, or rather, our future teachers, also appeared to develop an initial understanding of the subtleties and complexities of teaching mathematics early in the semester as they completed challenges in the *Patterns and Partitioning* module. This, in turn, led to an awareness that they needed to deepen their own mathematical understanding if they were to be effective teachers. These emerging interests and motivations enabled us to focus explicitly on important aspects of our instructional agenda as teacher educators relatively early in the course. As a consequence of using the modular web-based cases, we were therefore able to address more specific goals and objectives of the course in greater depth than had previously been the case.

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# Preservice Teachers and Multimedia Design: A Portfolio of Projects

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**Abstract:** This paper will review the evolution of our "Multimedia Design" course for preservice teachers since its beginning in the Spring of 1996 and will highlight some of the 300 plus multimedia projects developed by our students to date for use in their clinical experiences, in particular their student teaching practicum. Attendees of this session will receive a CD-ROM of sample multimedia projects.

"It was the best of times, it was the worst of times." I think the author may have been describing life as a technology professor in a preservice teacher education program. My initial experiences with trying to integrate technology into a teaching curriculum dates back to the early 80's (Drazdowski, 1985) when I was the seventh grade language arts teacher on a middle school teaching team in Juneau, Alaska. Although the technology has evolved dramatically since the days of the old Apple IIe, the concept of infusing technology throughout the curriculum is still very pertinent to teacher education programs today. It has now been five years since the education division at my college began the metamorphosis of its traditional "Methods of Instructional Design" to a course in "Multimedia Design" (Drazdowski, 1997). What a strange, fine trip it's been. It has certainly made coming to work each day exciting, unpredictable, and for the most part fun for the instructor and students alike.

Although the education division continues to face many of the same barriers to implementing technology that are often cited in many national reports (CEO Forum, 1999; Milken Exchange, 1999), the division continues to make successful strides forwards. Students are using our portable wireless laptop lab of iBooks to create iMovies of public service announcements in their "Foundations of Education" course (Dills & Ayre, 2001), to create concept maps using Inspiration software in "Educational Psychology," and to investigate websites and webquests in their math and science methods courses. Electronic portfolios are on the near horizon. All education majors are also required to take a "Computer Applications for Educators" course that is closely aligned with NCATE and ISTE (2000) technology standards for beginning teachers. And students in the "Multimedia Design" course have designed and created some 300 multimedia projects for use in their various clinical experiences.

Below is a brief summary of some lessons learned through our technology efforts over the past decade: a.) a combination of required technology courses and infusion of technology throughout the entire teacher education curriculum is most effective (Duran, 2001); b.) sustained administrative support for experimentation and vision is critical (Mehlinger & Powers. 2001); c.) risk takers and change agents among the faculty are needed (Strudler, 1991); d.)effectively using technology in specific courses and throughout the curriculum gives professors the opportunity to model concepts from constructivism (Jonassen, Peck, & Wilson, 1999; Sprague & Dede, 1999; Ferguson, 2001), problem-based learning (Boud & Feletti, (1991; Lieux, 1996), and collaborative and cooperative learning; e.)students need access to technology in their field settings and need to be placed with technology using cooperating teachers; f.) your students will always make you look good.

The multimedia projects created to date are as varied, complex, and creative as the students themselves. Since early childhood, elementary education, secondary education, and special education majors are all required to take the "Multimedia Design" course as part of their "Professional Semester," the topics can range from healthy teeth to Hamlet, from the ABC's to American literature, from a simple addition game to geometry theorems, or from parts of a plant to genetic crosses. As students present their various projects to the class each semester, lesson "f" is continually reinforced: "Your students will always make you look good!"

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# Using Electronic Models to Increase Preservice Teachers' Ideas and Confidence for Technology Integration

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**Abstract**: Given the difficulty involved in trying to arrange successful classroom technology experiences for preservice teachers, his study was designed to examine whether electronic models of exemplary technology-using teachers, presented via CD-ROM, could provide a viable alternative for developing ideas about, and self-efficacy for, technology integration. Sixty-nine students enrolled in a one-credit technology course completed demographic and online survey instruments before and after interacting with a CD-ROM that featured six teachers' classroom technology beliefs and practices. Results suggest that electronic models can significantly increase preservice teachers' ideas about and self-efficacy for technology integration. Furthermore, students' found the examples of teachers included on the CD-ROM to be both realistic and relevant. Implications are discussed as well as suggestions for future research.

## Theoretical Framework

New teachers today, despite possessing adequate technical skills and a strong desire to use computers in their classrooms, still report not feeling well prepared to teach with technology (NCES, 2000). Clearly, the growing increase in teachers' technical skills is insufficient to guarantee the effective use of technology in the classroom. In order to translate skills into practice, teachers need specific ideas about how to use these skills to achieve meaningful learning outcomes. While today's teachers are expected to leverage the full potential of powerful conceptual technology tools to meet the changing needs of their students, they have been given few, if any, opportunities to develop their own visions for, or ideas about, meaningful technology use. As Dexter, Anderson, and Becker (1999) explained, "For teachers to implement any new instructional strategy, they must acquire new knowledge about it and then weave this together with the demands of the curriculum, classroom management, and existing instructional skills" (p. 223). Teachers need information about *how*, as well as *why*, to use technology in meaningful ways. Lack of knowledge regarding either element can significantly decrease the potential impact that these powerful resources might have on student learning.

Yet even the best ideas about technology use will go unused unless teachers believe that they are capable of implementing them in the classroom. In particular, teachers' beliefs about their *ability to use computers* in instruction may be key, given the role self-efficacy is proposed to play in determining behavior. Self-efficacy refers to personal beliefs about one's capability to learn or perform actions at designated levels (Bandura, 1997). According to Bandura, "beliefs of personal efficacy constitute the key factor of human agency" (p. 3). Thus, teachers who have high levels of efficacy for teaching with technology are more likely to participate more eagerly, expend more effort, and persist longer on technology tasks than teachers with low levels of efficacy.

Researchers in the area of self-efficacy describe four primary sources of information that can influence judgments of efficacy: personal mastery (successful task completion), vicarious experiences (observing models), social persuasion ("I know you can do this!"), and physiological indicators (emotional arousal, relaxation). Next to personal mastery, vicarious experience provides the most valid information for assessing efficacy (Schunk, 2000). According to Olivier and Shapiro (1993), "vicarious experiences with the computer increase one's feelings of control and confidence" (p. 83). Given the logistical difficulties involved in providing preservice teachers with enactive experiences related to successful technology integration, teacher educators have turned to modeling as a feasible, yet powerful, method for increasing teachers' ideas about and self-efficacy for technology integration (Schrum, 1999). Not only can models provide information about *how* to enact meaningful technology use but they can increase observers' confidence for generating the same behaviors (Schunk, 2000).

Many factors have been shown to influence observers' responses to models including the prestige and competence of the models, consequences experienced by the models, perceived similarity of the models to the learners, as well as learners' own self-efficacy for performing the behaviors (Schunk, 2000). However, research has yet to establish whether models, presented electronically, can be used to achieve results similar to those achieved with live models. Will learners perceive themselves as similar to models that are presented electronically? Will they regard the models as both realistic and relevant? Given the increasing potential to present models of exemplary technology use via multimedia technologies, it is important to determine the extent to which pre- and inservice teachers can benefit from observing these types of electronic models.

## Purpose of the Study

This study was designed to examine the effects of electronic models on preservice teachers' perceived ideas about, and self-efficacy for, technology integration. Specifically, exemplary technology-using teachers were presented via a CD-ROM teacher development tool, called VisionQuest (VQ). VisionQuest features the classroom practices of six k-12 teachers and is designed to support users' reflections on both the underlying beliefs and classroom strategies that enable exemplary technology use. Given the few opportunities preservice teachers have to observe exemplary technology use in actual classrooms during student teaching or observation sessions (Vannatta & Reinhart, 1999), VisionQuest was developed to provide these opportunities. Specifically, the research questions were:

- What effect does observing exemplary technology-using teachers, presented electronically, have on preservice teachers' perceptions of ideas about technology integration?
- What effect does observing exemplary technology-using teachers, presented electronically, have on preservice teachers' perceptions of self-efficacy for technology integration?
- What are students' perceptions of the use of electronic models for learning about technology integration?

## Research Design

A pretest-posttest research design was used to examine increases in preservice teachers' ideas about, and self-efficacy for, technology integration following two 50-minute class sessions in which students used VisionQuest. Of the 103 students enrolled in six sections of an undergraduate educational technology course, 69 students signed a consent form and completed all three data collection measures needed for the study. Participants ranged in age from 18-34 years ($x = 20$). The majority of the students were female (65%), sophomores or juniors (71%), and majoring in Elementary Education (60%). When asked to rate current levels of computer skills, 75% of the students rated their skills at an intermediate level while 9% rated themselves as beginners; 16% rated themselves as advanced. None of the students rated themselves as novice users.

## Methods

Demographic information was collected during the first class session of the semester. During weeks 10 and 11, as part of their normal class activities, all students worked with VisionQuest, completing two different tasks.

During the tenth week, students evaluated VisionQuest as an example of professional development software. Students focused on content the following week when they used VisionQuest as a modeling tool to examine the beliefs and classroom practices of the teachers included on the CD-ROM. Students were asked to describe how the different teachers prepared their classrooms for technology use, how they used various grouping strategies to manage their rooms, how they managed classroom "chaos," and so on.

At the beginning of the tenth class session, prior to evaluating VQ, students completed an online survey designed to collect three types of information. First, information was collected regarding students' computer ownership, current use, and perceptions of skills and comfort using computers (e.g., "I enjoy working with computers." "When using computers, I can deal with most difficulties I encounter."). Eight items comprised this initial section. The second section included seven items regarding students' *ideas* for technology use (e.g., "I have ideas about how to use one computer effectively during large group instruction."). Items were presented in a Likert-style format; students were asked to rate their level of agreement (from 1-strongly disagree to 5-strongly agree) with statements related to the possession of specific ideas regarding technology use. The third section used the same seven items but with an emphasis on the possession of *confidence* rather than ideas (e.g., "I am confident I can use one computer effectively during large group instruction."). Students used the same rating scale to record their levels of confidence. Students' responses to the online surveys, prior to using VQ, comprised pretest measures of students' perceived ideas about, and self-efficacy for, technology integration.

At the end of the eleventh class session, after students had explored the ideas presented by the models on VQ, students completed the second and third parts of the online survey again. These measurements served as posttest indices of students' perceived ideas about, and self-efficacy for technology integration. In addition, four items were included to explore students' perceptions of using VQ as a modeling tool (e.g., "I can relate to the examples of teachers shown in VQ." "I can relate to the examples of technology shown in VQ.").

During both class sessions in which students interacted with VQ, one or two researchers were in attendance, making observations of students' engagement with the software. Observations provided evidence of the "holding" quality of the software and also provided useful information for the selection of interviewees. Students were purposefully selected for interviews (one or two per section) based on noted levels of interest, with an attempt to choose one highly- and one less-engaged student from each section. Interviews were scheduled at a time convenient to each participant and were audiotaped and transcribed by the interviewer. Interviews focused on identifying specific ideas (about classroom organization, assessment practices, etc.) that students gained from VisionQuest and the extent to which they thought they would use these ideas in their classrooms. We were particularly interested in knowing whether students regarded the VQ models as "real" and whether they believed that they had learned from them, just as they might learn from live models.

## Results and Discussion

### Students' Perceptions of Ideas and Self-Efficacy for Technology Integration

A two-tailed paired t-test ($df = 68$) indicated a significant increase in students' ratings of perceived ideas about technology integration ($t = 8.85$; $p < .0000$) from pre- to post survey. A two-tailed paired t-test ($df = 68$) also indicated a significant increase in students' ratings of perceived self-efficacy for technology integration ($t = 3.46$; $p < .000$) from pre to post survey.

Based on a critical $r$ value ($df = 66$) of .35 ($p = .0005$), correlations among demographic characteristics and pre- and post- ideas and self-efficacy indicated no significant relationships among age, gender, or year in school (freshman, sophomore, etc.) and ratings of computer skills, ideas, or self-efficacy. Although one might expect advanced college students (e.g., juniors and seniors) to have more skills, ideas, or confidence, this was not the case here. Furthermore, there were no significant relationships between gender and any variables examined in this study.

Significant correlations were found between students' perceptions of their ideas for technology integration, before and after using VisionQuest ($r = .61$); similarly students' perceptions of self-efficacy for technology integration ($r = .50$) were significantly correlated before and after using VisionQuest. Additionally, perceptions of ideas and perceptions of confidence were significantly correlated. Students who began with greater perceptions of ideas, also tended to have higher levels of confidence ($r = .72$). This relationship was even stronger at the time of the posttest ($r = .84$). That is, the more ideas students had about technology integration, the stronger their beliefs that they can be successful integrating technology into the classroom. As ideas increased, so, too, did confidence for implementing the ideas.

Interestingly, judgments of computer competency (skills) were not highly correlated with either ideas or confidence for technology integration. This supports earlier research findings (Yildirim, 2000) that suggest that simple skills training is insufficient to prepare students to use technology in the classroom. In fact, students' perceptions of the direct usefulness of their skills may have decreased after seeing how the teachers on VisionQuest were not dependent on high skill levels, although this conjecture requires further examination. Furthermore, skill competency did not seem to translate into confidence for achieving integration either pre- or post-VQ ($r = .18$ and $.26$ respectively). Just because students know how to use word-processing, email, and the Internet, does not mean that they know how to use these skills within classroom instruction or that they are confident trying to do so.

Based on the correlations obtained, providing preservice teachers with specific integration ideas (e.g., how to organize a classroom that uses technology, how to assess student technology products) via electronic observations of technology-using teachers may be more effective than skills training for increasing their self-efficacy for technology integration. Furthermore, by increasing future teachers' self-efficacy, we increase the probability that these behaviors will be implemented in their future classrooms. According to Olivier and Shapiro (1993), "Self-efficacy has been shown to be an excellent predictor of behavior. Individuals with a low sense of self-efficacy will, more often than not, shy away from the best alternative, and, instead, choose an alternative that they believe they can handle" (p. 84). Even when practicum and student teachers possess "positive dispositions towards computer use," they often lack confidence in their ability to teach successfully with computers (Albion, 1999). This lack of confidence for teaching with computers has been shown to influence the levels of computer use by student and beginning teachers.

### Students Perceptions' of Learning from Electronic Models

Interviews with 10 students, as well as data obtained through four post-survey items and two software evaluation questions, were used to answer our research question regarding students' perceptions of using electronic models to learn about technology integration. Interviewees were representative of the students enrolled in the class; interviewees included both male and female students who ranged in age from 18-34 years and in skill levels from beginner to advanced.

Two questions on the software evaluation form asked students to rate the relevance of the activities and models observed on VQ. On a scale from 1 (strongly disagree) to 5 (strongly agree), students agreed to strongly agreed that "activities regarding the use of technology were realistic" (mean = 4.46) and that "the video cases of teacher interviews and class activities were relevant" (mean = 4.31). Four similar questions included on the post survey averaged a 3.96 rating indicating that students' perceived the VQ models to be both realistic and relevant.

Although students had suggestions for improving the software (particularly in terms of navigation, which was unfinished at the time), interview comments were overwhelmingly positive. Students viewed the models as realistic, indicating that they felt as though they were in the classrooms with the teachers. Students described the "life-like" quality of the videos and how they felt that the teachers were talking directly to them (S: I felt like they were talking to me as a teacher and not as a student). As an example, one student stated:

> I liked it. I liked how I got involved when it showed you (the clips) and you felt like you were right there in the classroom with the students watching them. It's like you're in a movie theater almost because they have such good (videos)... and it shows the students and it shows the teachers – and you feel like you're right there in it.

Based on these results it appears as though students both enjoyed and benefited from observing the electronic models provided on VisionQuest. Interview comments suggest that preservice teachers perceived that the use of electronic models was a positive approach that provided "life-like" learning experiences.

## Educational Implications

Data from this study support our hypotheses that electronic models can be used to increase preservice teachers' ideas about and self-efficacy for technology integration. Even though students used VisionQuest for a relatively short period of time over the course of two class sessions (approximately 90 minutes total) and were unable to explore the entire content of the CD-ROM, students showed significant increases in both their perceived ideas about and self-efficacy for technology integration. Interview and software evaluation comments indicated that students found the models to be both realistic and relevant. Students described a number of specific ideas that they gained from the models and furthermore, described their intent to apply these ideas within their future classrooms.

Students' pre- and post- ratings of their ideas and confidence were not significantly correlated with their judgments of skill levels, suggesting that computer skill competency does not translate directly into ideas or confidence for classroom technology use. However, there were significant correlations between students' perceived ideas and confidence, especially at the time of the posttest suggesting that as students see new ways to use technology and develop new ideas about technology integration, they develop higher levels of confidence about their ability to use technology in a variety of ways.

The results of this study suggest that preservice teachers can benefit from observing teacher models presented via multimedia case examples, such as those featured on VisionQuest. Whether delivered via the Web or CD-ROM, multimedia models are becoming more readily available for use by teacher educators. These types of examples can be incorporated into an educational environment for self-paced exploration, as a small group reflection tool, or as an instructor-led activity. From an instructor's perspective, electronic models can positively impact the authentic nature of a course and simultaneously increase the confidence and integration beliefs of students. This type of modeling can help preservice teachers develop a vision for what technology integration looks like in real classroom as well as strategies for implementing those visions.

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# How and when do students become "invested" in online collaboration?

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Teacher candidates often express concern with the conventional pedagogy of their methods classes, complaining of a need to see challenging, reform-oriented teaching in action (Ferdig, Hughes, Packard, & Pearson, 1998; Hughes, Packard, & Pearson, 2000). They describe instruction that is limited to articles, books and lectures about methods of teaching reading and writing (Ferdig et al., 1998). Most universities have responded to this call, supplementing students' in-class experiences with classroom observations and internships. However, even when provided with these opportunities to 'watch' pedagogy in action, pre-service teachers often fail to see (or are failed to be provided with) teaching models that align with the focus of university pre-service preparation programs (Kinzer & Risko, 1998).

Educational researchers have responded to this problem by introducing web-based learning environments that attempt to supplement preservice teacher education through technologies such as web-based learning environments (Ferdig, Roehler, & Pearson, 2001). Research in this area provides evidence that this form of instruction and electronic medium can be successful. In one study, Ferdig, Roehler, and Pearson (2001) found evidence that students who participated in the electronic forum were more likely to demonstrate a deeper understanding of pedagogical diversity as well as a more complete approach to the teaching and learning of literacy. In a different study, students who posted more frequently to an electronic discussion forum (and thus participated most in the assigned classroom activities) reported both increased interest in the course and mastery of the material (as evidenced by their self-evaluations and class journals) (Davis & Ferdig, 2001). In both cases, students had the opportunity to become meta-analytic and meta-cognitive about their participation and journey towards becoming fully enculturated into the community of practice known as teaching.

Unfortunately, in both cases, researchers reported data suggesting these claims were substantiated only when students became "invested" in the technology. In other words, gains and successes were measured only when students fully participated in the electronic activity. Neither case reported the process in which students became invested, nor did they describe the characteristics or context under which students became emotional, intellectually, and behaviorally involved in the activity. In both cases, authors called for future research to examine and define exact contexts in which students would become invested in both the classroom integration and the new technology.

The purpose of this paper is to discuss, from a psychological perspective, ways in which several preservice teachers became invested in electronic innovation. We describe how supplemental discussion forums were used in preservice education courses to further students': a) skills and abilities in working with diverse populations of students; b) knowledge and adoption of psychological and developmental theory; and c) ability to integrate cutting-edge technology innovations into their instructional design. Most importantly, we describe characteristics of electronic learning contexts in which students are most likely to become invested emotional, intellectually, and behaviorally.

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# Video, database, and web-based learning environments as tools for preservice education: The case of the Reading Classroom Explorer

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Teacher candidates often express concern with the conventional pedagogy of their methods classes, complaining of a need to see challenging, reform-oriented teaching in action (Ferdig, Hughes, Packard, & Pearson, 1998; Hughes, Packard, & Pearson, 2000). They describe instruction that is limited to articles, books and lectures about methods of teaching reading and writing (Ferdig et al., 1998). Most universities have responded to this call, supplementing students' in-class experiences with classroom observations and internships. However, even when provided with these opportunities to 'watch' pedagogy in action, pre-service teachers often fail to see (or are failed to be provided with) teaching models that align with the focus of university pre-service preparation programs (Kinzer & Risko, 1998).

In response to these concerns, we developed the Reading Classroom Explorer (RCE). Originally a CD-ROM product for the Macintosh, the current iteration of RCE is a web-based learning environment for pre-service teachers studying literacy instruction. The goal of RCE is to provide multiple opportunities for teacher candidates to develop rich understandings about teaching and learning in classrooms where diversity of pedagogical approaches and diversity of student populations are evident (Ferdig, Roehler, & Pearson, 2001). An RCE user logging into the system is provided with an opportunity to search over 300 movie clips using four different search mechanisms.

First, they may decide to search by school or "case." RCE contains movies from ten major elementary school 'cases' from throughout the United States (i.e. Hawaii, San Antonio, Harlem, and Lansing). Students may choose to watch the entire video from a case (~45-60 minutes), or they can select specific components within that full case. A second option is to select movie clips by choosing a Theme. Much like a table of contents, the themes are broad categories divided by "Teacher", "Student", "Curriculum", and "Context." Examples of themes include "Assessment", "Planning", and "Management Strategies." Users might want to search more specifically, and thus they would chose the third option of searching by Keyword. If the themes are like a table of contents, then the keywords are the index for that book. Keywords are much more specifically designated, and include words like "book clubs" and "decoding." A fourth and final way to search is to use a free-form text search, referencing text that is either in the transcripts or the general description of a clip.

Once a movie clip is selected and the title is clicked, the user is sent to a webpage that contains the video and any related information for the clip. Using Real Player, a user only has to wait 3-4 seconds for the video to begin playing—one of the major benefits of a web-based system. The transcript, related keywords and themes, links to artifacts that may appear in the clip (e.g., pictures of students' work shown in the clip), and any other related information also appear on the page. In order to stimulate further thought on the video, questions—and a notepad to save responses into—are provided for each individual clip.

One of the problems with a CD-ROM based product is that interaction between students is limited to those students working together, or a "share-time" provided by the teacher after using the tool. Since RCE has moved to the web, we are now able to provide students with scaffolding through social interaction. For instance, if a user wishes to see what others thought about the movie clip, he or she merely has to click on a button and anonymous responses (provided the user has granted permission) pop-up in a new window. Or, if a user has a specific question, they can go to the "RCE Discussion Forum", where messages are hierarchically saved in either a "General Room" or a room designated specifically for that students' class (provided they are part of a class). At any point in time, a student has access to all of their notes, which is important if a student decides to write and/or submit a paper online. RCE provides the opportunity for students to write papers that include links to specific movie clips discussed in their paper, and then electronically publish that paper to their teacher, their classmates, or RCE users as a whole.

Up until now, we have basically described the user side. RCE also has a "teacher" side. The teacher can log-in at any time to read student papers and to answer questions from their students. They can also go to their own discussion forum to discuss ideas (i.e. collaboration) with other RCE instructors. Finally, RCE instructors can create, save, and search saved lesson plans regarding implementing RCE into the curriculum.

In recent studies, data has been collected that suggests RCE is beneficial to instruction in a number of ways. For instance, evidence suggests that students using RCE, and specifically the discussion forum in RCE, are more likely to demonstrate a deeper understanding of teaching and learning (Ferdig, Roehler, & Pearson, 2001). They are also able to relate what they have learned to experiences outside of the RCE learning environment (their internship, other classes, etc.). Research is currently being conducted that explores issues of diversity, as well as dispositions and skills related to literacy instruction before and after the use of the Reading Classroom Explorer.

The purpose of this interactive session is to present audience members with a new web-based learning environment for preservice education. Audience members, specifically those who teach preservice methods classes, will be invited to use the web-based learning environment in their own classroom. More importantly, they will also be invited to join the RCE research team in exploring innovative ways to teach preservice teachers about pedagogical and student diversity. Novice and expert technology users are invited to attend, as minimal technology expertise is required. Specific objectives of this presentation include:

1. exploring an innovative web-based learning approach to preservice education
2. discussing new integrations for teacher education that highlight pedagogical and student diversity
3. discussing research techniques and possibilities for innovative learning technologies

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# Distributed Learners – Motivated Classrooms
# Building Class Knowledge

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Abstract: Using technology requires wide expertise. Teachers need expertise for everything from troubleshooting everyday hardware and software problems to helping students keep up with the latest technology. This need for expertise can place a large strain on the teacher as the sole provider of information. One method that can be modeled in teacher education programs and in the classroom to alleviate this strain and model professional work practices is to distribute some of the knowledge and responsibility among students. In professional work teams one person is rarely the expert on all topics, so the team shares information to accomplish team goals. Similarly, students can become experts in some areas and share their expertise with their class. Small student groups can be formed where each group has two main roles. In the first role, the group helps with general tech support for the classroom. If a question comes up in the classroom about using the scanner, a student group would use class reference materials to find a solution before approaching the teacher. Students gradually learn how to handle more basic tech support issues on their own. The second role of the group is to bring new knowledge into the classroom. Each week a student group researches technology innovations relevant to class work or background information on a class technology topic. They present this research to the class to share their new knowledge. In this model students are in charge of seeking knowledge and helping to build collective classroom knowledge. This yields empowerment for the student, ownership over their learning, and a model for bringing in new information to the classroom.

With the advent of technology standards and a greater need for students to be prepared for a technologically complex world, teachers are required to gain greater technological expertise. Coupled with the need for technology expertise is the need to be prepared for new forms of changing and advancing technologies. Technology integration results in a classroom that requires constant upkeep and updating of that technological knowledge. Although professional development workshops exist to help teachers "catch-up" with new technology and technology implementation methods, how can teachers learn about new technologies while being able to support present technology in the classroom? This dual problem can be addressed by modeling class management methods in teacher education classes that can be transferred to student classrooms. Distributing the learning process for understanding implemented technology and for incorporating new technology can help teachers survive the changing environment that results from technology integration while helping them stay updated on current technology.

## Tech Support Teams

One method to help support present technology use in the classroom without deep expertise would be to engage the help of students in technical support. For example, students can volunteer or be placed in small teams in charge of technical support for the class. These teams are asked to use the Internet, help manuals, and software support books for find answers to basic software issues before approaching the instructor in the class. This management method helps students learn details about the software while alleviating the need for the instructor to be a software expert. This method will also help students learn different pathways for help support systems. In professional work environments, there is rarely one person who knows how to solve all the technical problems and therefore solving these problems requires team members to seek out answers. Students learn the various ways that professionals use to seek out answers. Although students may not always solve the technical problem, they will learn to use the resources available before approaching the instructor. If the students are unable to uncover the answer, the instructor can address questions that cannot be answered from this pathway. Students become more self sufficient in organizing methods to help themselves and others. Teacher education or professional development workshops that model finding help support and building the help support pathway, will help teachers learn to deal better with technology problems that arise in the classroom, without losing time and attention with students. This action also prepares the teacher to become more of a facilitator in the classroom rather then the pinnacle of knowledge for students. Teacher become better able to adapt to new versions of existing technology, since they are prepared to answer questions or help students understand how to answer new questions without spending large amounts of time becoming experts in that technology.

## New Technology Research Teams

Technology is dynamic and new forms of technology emerge daily. When using technology in the classroom, instructors need to be prepared and keep their students apprised of any new developments in this field. How can instructors keep up with the newest technologies as well as how these technologies impact the future of the field? One method is to have an ongoing seminar series where small groups of students are designated "research teams." These teams are responsible for introducing new technology topics to the class. Students not only model professional practice, but also become proactive about their learning. Similar to professionals who must always stay apprised of the most current technologies and trends, students will contribute to the class ability to be aware of the most current technologies and trends. The class builds its own knowledge and sets up a model for keeping up with technology. The instructor re-asserts the role of the facilitator instead the sole provider of knowledge.

## Conclusion

Distributing tasks among students helps the instructor manage technology issues in the classroom. Students are responsible for learning pathways that seek help, while supporting and improving collective knowledge by bringing new information into the classroom. Modeling this methodology helps future teachers empower students to become proactive in their education while utilizing professional practice, which gives more validity to their work and supports the idea of an instructor as a facilitator. The main benefits for teachers are the following:

- Teachers can concentrate on the content of the project or unit
- Processes of thinking, and problem solving are emphasized
- Students have ownership of both content and process
- Learning is natural and student-centered

# Systematic Observation of Student Teaching Episodes

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## Introduction

Our question was simple. What can we do to best prepare preservice teachers for the rigor of their first year of teaching. We believe that good teaching behaviors are quantifiable, transferable, and masterable. Good teaching behaviors can be observed and measured, they can be learned by observation and practice, and they can, with practice, become a natural part of a person's teaching presence. Our response was to focus on developing a Pedagogy Lab; a high-tech facility for video viewing, editing, and recording designed for student use in documenting their own teaching episodes. This short paper reports on the system implemented within the Pedagogy Lab including the hardware selected, student process developed, and lessons learned in the course of the first year of the Pedagogy Lab.

## The Pedagogy Lab

The Pedagogy Lab is a technology lab designed to facilitate student learning in identifying, learning, practicing, and mastering specific teaching behaviors. To do this, we have created a facility to that allows students to observe and document teaching behaviors using real world examples as well as requiring students to record, edit, and assess examples of their own teaching episodes.

### *Key Features of Pedagogy Lab*

Key features for our Pedagogy Lab include digital video viewing station, digital video editing stations, and digital video authoring stations. Each of these stations fits within one or more of the activities that are in our good teaching cycle.

#### *Viewing Stations*

The digital video viewing station allows students to focus on viewing example or their own videos of teaching and quickly documenting specific teacher behaviors. This includes a custom computer program designed to assist students in systematically recording, coding and reporting observed teacher behaviors.

#### *Editing Stations*

The digital editing stations use Apple's iMovie for the clipping, titling and output to quicktime for students as they identify and document specific teaching behaviors from their own teaching opportunities. Our custom computer program for recording, coding and reporting observed teaching behaviors will allow students to improve their self assessment of their teacher behaviors.

#### *Authoring Station*

The authoring station utilizes Apple's iDVD, students will create final products that document their skills in the teaching environment. DVD output allows students to create feature rich long videos of their teaching performance.

## Process

1) Classroom instruction on systematic observation focuses on teaching students to identify specific teaching behaviors.
2) Students review and practice their systematic observation skills by observing non-specific lessons which students will code using the systematic observation computer program within the pedagogy lab.
3) Students record and review their own teaching episodes within the Pedagogy lab utilizing the systematic observation system to identify their own abilities and deficiencies.
4) Make and implement a plan for improvements, further teaching and lab time to assess improvements on specific behaviors.
5) Students may create final products that contain exemplar episodes of their own teaching.

## Presentation Outline

If accepted, we will share the development of our systematic observation system, example video episodes, and lessons learned in the first year of our implementation schedule. We will also bring a complete student presentation documenting one student's journey from classroom instruction to completed final product.

# A Web-based Solution for Integrating Technology into Teacher Education Courses

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**Abstract**. The purpose of this study was to research, develop, and validate a product to assist faculty in meeting accreditation standards for integrating technology into teacher education programs. The design used in this study included three phases of research and development. Phase one used an online survey to determine if teacher educators perceived a need for assistance in meeting technology standards. A prototype of a Website interface to relational databases of information on technology tools and standards was then designed to meet those needs. Phase two involved evaluation and modification of the prototype using focus groups and feedback through an online questionnaire. The third phase involved a field test by teacher educators from two institutions preparing for NCATE review.

## Introduction

Even though computer technology and Internet access have become more available in public PreK-12 schools throughout the United States (NCES 2000), teachers have not been prepared to integrate the technology into instruction (Resnick 1999; Trotter 1999; NCES 1999). As a result, teacher education programs have been challenged to better prepare teachers to integrate technology to meet content standards (CEO Forum, 1999). Unfortunately, teacher educators are not always prepared to provide effective models of technology integration (Glennan & Melmed 1996; NCATE 1997; Queitzsch 1997). They lack models and experience with technology, receive few rewards and incentives to integrate technology into their own classes, and do not have adequate professional development and support to develop their own skills (Green 2000).

In addition to increased public pressure to better train teacher candidates to integrate technology, teacher educators are also faced with increasing numbers of standards to be met, both in their content areas and in broader areas of education. NCATE has recently revised accreditation standards to include outcomes-based criteria (Wise 2000). The NCATE standards are broad in scope and are supported by more specific standards developed by professional organizations such as ISTE (NCATE 2000; ISTE 2000). Both sets of standards are new to teacher educators and require new thinking in terms of course goals and objectives.

Integration of technology into instruction requires training in the technology but training alone has not resulted in integration (Barron & Goldman 1994; Cravener 1999; Gilbert 1995; Gillespie; Matthew et al. 1998; NCATE 1997; Rogers 2000; Taylor & Little 1996). Professional development in higher education has been based on the traditional workshop model (Calves 1999; Gillespie 1998; Lieberman 1995). The workshop model has not been as effective by itself as it is when combined with other professional development strategies such as one-on-one mentoring, action research, and more collaborative models (Apple Computer 1995; Darling-Hammond & McLaughlin 1995; Eiser & Salpeter 1992; Howey 1994; Johnson, Johnson & Smith 1991; Valli & Cooper 1999; Webb 1996). Effective training in technology integration involves a constructivist learning environment, situated staff development, time for reflection, team planning for implementation, and ongoing dialog (Apple Computer 1995). Collaboration (Dede 2000; Ringstaff, Yocam, & Marsh 1996), any time, anywhere support (Gilbert 1996), inspiration and excitement (Milone 1999; Rogers 2000), and variety (Milone) also contribute to the success of professional development in technology integration.

## Methodology

A research and development model was used to develop the product in this study. Three phases of development included a needs assessment, the evaluation of a prototype based on the results of the needs assessment, and a field test by teacher educators who used the product to identify technology integration tools and activities for their own courses. Online questionnaires, focus groups, peer evaluation, and a field study were used to gather feedback and draw conclusions during the phases of development.

Each phase used participants from different populations. The first phase surveyed members of the ISTE NETS*T writing team to determine if there was a need for a product to assist teacher educators with integrating technology. Participants from 11 states responded to the survey. The second phase utilized 2 focus groups in the development of a prototype and an online survey administered to directors of $PT^3$ grants to evaluate the resulting product. The third phase involved 8 teacher educators from 2 Midwestern universities in a field test of the product. The participants represented both elementary and secondary fields in teacher education as well as a diversity of technology background and expertise.

## Conclusions and Implications

### Phase One

The results of the needs survey in phase one resulted in the most intriguing information of any of the surveys in the study. The results indicated that a majority of the participants in the needs survey believed teacher educators do need assistance in integrating technology. Respondents viewed colleagues in their teacher education program as having more skills than sufficient knowledge to integrate technology. This response may indicate that participants perceived their colleagues as knowing more about how to use technology than how to teach with it. Integrating technology is a multi-layered process. It requires a new or revised pedagogy as well as new technical skills. Teacher educators must rethink how they teach and how the content is conveyed with few models and little experience of their own. They may know how to use the technology for their own productivity without having integrated it into their instruction.

Participants also reported their colleagues were not familiar with NCATE and ISTE standards yet nearly half reported that course syllabi in their programs identified ISTE standards and over half reported indicators of technology skills and concepts were included in their programs. This discrepancy may be a result of technology being taught in computer courses rather than being integrated into curriculum and instruction courses or methods courses. When technology is taught as a separate course, the teacher educators may consider it someone else's responsibility to teach their students how to use technology in instruction. Unless teacher educators were involved in the field of technology it is possible that they would be unfamiliar with technology standards unless they had a technology leader in their midst or were preparing for an NCATE accreditation visit and were held accountable for knowing the standards.

Responses to the question on accountability may explain why programs and syllabi identify technology standards and outcomes but faculty are judged lacking in knowledge and require assistance to integrate technology. Almost three-fourths of the respondents reported that teacher educators were not held accountable for integrating technology. This lack of incentive may account for the lack of actual technology integration.

Because any time, anywhere support is so widely sought, the lack of interest in CD-ROM delivery was surprising. Even paper manuals received a higher ranking than did CD-ROM delivery, either as a manual or in an interactive format. Since paper manuals have the same static content available as CDs, the technology involved in CDs may be the factor. CDs and paper manuals need to be stored and retrieved requiring extra steps for the user while the Web is omnipresent on networked computers. It is possible that faculty are uncomfortable with the installation necessary on some CDs or that they find navigation on the Web more familiar than varying metaphors and navigation on CDs. The Web does have the advantage of being updated as technology and strategies change. However, the Internet can go down and is notoriously slow on some overworked campus networks. The reasons behind the reported preferences, especially for the high ranking of the paper manual, should be clarified by further study.

### Phase Two

The positive responses to the feedback form in phase two showed that the prototype of the Web interface was workable but needed improvement. The layout of the integrated lessons was designed by members of a focus group who desired a simple one-page format but wanted to be able to connect to more information if desired. This feature was easy to accommodate with related databases. Reviewers responded favorably to the primary colors of the Web site and to the metaphor of the robot as their assistant. They judged the content to be accurate, useful, and appreciated being able to browse through the hypermedia environment of the Web.

One of the most interesting comments in the feedback at this point was the comment made by one evaluator that the product appeared to assume that the users had the necessary knowledge to use the technology and only needed to be nudged. Even though the needs survey indicated that the participants in that phase viewed their colleagues as having the necessary skills, this respondent did not think her colleagues knew enough to use the technology. Her experience may be more common than those of teacher educators involved in technology grants and initiatives. To accommodate for this need, more tutorials were added to the technology tools section.

### Phase Three

The teacher educators who field-tested Integration Assistant were very positive in their responses about the ease of use and content. Most of the participants found the Web site easy to navigate but several made comments that indicated that they could not find what they were looking for even though the material was there. These comments may reflect a lack of understanding of how relational databases fit together, lack of knowledge about how to conduct a search, or need for better organization of the Web site.

Most comments in phase 3 focused on the content in the databases. Two users asked for more specific examples in their content areas. Another participant asked for more examples in the tour to help search the databases more effectively. In general, the participants were satisfied with the content and found it useful. When asked to identify the least helpful section, several of them responded that none of the sections were "least helpful" and went on to describe what they liked about the product.

Users were invited to enter an activity or technology tool in the Integration Assistant databases. Three of the participants in phase three did enter integrated lessons. The Web interface did not allow as complete an entry as did Instant Web publishing or direct access to FileMaker©. One participant asked to be allowed to enter the activities directly into the Instant Web publishing interface to the database rather than try to fit into the fields allowed in the Integration Assistant interface. Her request pointed out the wide variance in users' skill levels. Other participants in the evaluation stage did not even realize that they were working with a database. Further development of the Web interface could facilitate entry of data by novice users.

## Conclusions and Recommendations

The feedback in all three phases of this study indicates that teacher educators do need assistance with integrating technology into their courses. Respondents to the needs survey reported a variety of support was available to their faculty, that faculty had technology skills, and that their programs did specify technology outcomes. In spite of the presence of such support and knowledge, faculty did not have the knowledge necessary to integrate the technology. This discrepancy raises questions related to integration and knowledge of technology. What factors have inhibited acquisition of the necessary knowledge if most of the teacher educators have the necessary skills? Do the rankings of the respondents represent an accurate perception of teacher educators' knowledge? Would the teacher educators rate themselves the same way the participants did?

The efforts of initiatives such as the U.S. Department of Education PT$^3$ grant program should continue to focus on integration strategies in teacher education programs to better encourage teacher educators to model technology integration. If it can be determined that teacher educators actually do have the necessary skills but do not integrate technology, then professional development in SCDEs should focus more on integration strategies and less on skill training. Furthermore, teacher education programs should establish clear measures to hold faculty accountable for meeting standards identified in course syllabi and program documents.

The preference for a Web-based mode of delivery expressed by the respondents to the needs survey should be considered as teacher education programs develop support and training for faculty to meet accreditation guidelines. The Web-based product, Integration Assistant, provided helpful content and a convenient format for the participants in the study. Feedback indicated that teacher educators wanted more information for themselves and for their students and liked the easy access through the related databases. Textbook publishers and instructional design teams should continue to explore and develop the use of databases and Web sites to share current information on rapidly changing technologies and instructional strategies. Further study on the use of interactive materials in comparison to the use of textbooks and static print materials should be conducted to determine which mode of delivery best meets the needs of teacher educators.

One of the difficulties in designing a Web interface to relational databases is how to organize the information so that it takes few clicks for the users to find the necessary information. While the designer is very familiar with the data and how it is organized, the user does not share that same frame of reference. Further study on human factors that influence the ability to find information would provide useful information for Web developers. The development process of this product raised several questions for study. Does understanding the technology make the search for content easier? How much does technical background affect the user's ability to search and find content? What key factors determine a user's ability to find the desired information? How much and what kind of assistance is helpful in a tour?

Relational databases provide easy access to information and provide an interactive interface between the user and the data. Continual updating of data adds to the timeliness of the information that cannot be reproduced in paper manuals. The technology involved in a Web interface to relational databases requires the developer have the support of a Web designer and a network administrator, have fairly sophisticated skills in developing and using FileMaker©, and have knowledge of how to write scripts for the Web interface. Providing and updating the content is time consuming because the developer must keep current with new resources and continually analyze and enter new information into the databases. Writing descriptions for users with different backgrounds and keeping up with changing technology also requires experience in instructional design as well as a background in technology support. Any further development of Integration Assistant or a similar product would be best accomplished by a team with expertise in Web development and relational databases or by a publishing company.

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# Integrating Technology Experience into Student Teaching: A Model for Preservice Teachers' Technology Education

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**Abstract:** Effective integration of technology into curriculum and instruction has received much attention in education, and teacher education programs are expected to equip the preservice teachers with both technology literacy and teaching methods with technology. In most of the teacher training programs, the common practice is to insert technology-related courses as required courses into teacher education curricula. But it is not a practicable solution to the problem, which is the lack of effective use of technology by new teachers in school settings (Bruder, 1991).

In this study, a new model of integration of technology into preservice teacher technology education is explored. The study is conducted in an elementary class setting through a webpage building project. The participants are student teacher, classroom teacher, college technology staff, and students. Before the study, both student teacher and classroom teacher are new to the webpage design. An interview with the student teacher is conducted regarding his technology literacy, proficiency, and attitude toward technology use in teaching. During the process, the student teacher acts both as trainee and trainer. As the project proceeds, the role of the student teacher focused more, until totally, on a trainer. The webpage of the class is well designed and uploaded as a result of the cooperation of the student teacher, classroom teacher, college technology staff, and the students. An after-project interview is also conducted with the student teacher. Results show that such an on-site technology experience contributes significantly to preservice teacher's technology competence and increasing his attitude positively toward using technology in their future teaching.

**Keywords:** preservice teacher, teacher education, technology

# Learning to See, Learning to Teach: Developing Video Case Studies From One's Own Practice

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**Abstract:** This paper describes a case study approach in a field seminar for pre-service teachers. Building on the focus of reflective practice, students develop a video segment from a videotaped teaching scenario into a case study format. In the seminar discussions, students present their own case studies to other students, cooperating teachers (who are part of the seminar) and university faculty. The goals of this authentic assessment are to (1) inquire into specific teaching practices pre-service teachers experience through individual ways of knowing; (2) use multimedia tools as partners in inquiry and meaning-making; (3) connect teaching performance, best practice standards and reflective assessment; and (4) use mediated learning in a more conscious and empowering context for continuous learning, research and reflection. The paper includes assessment criteria, examples of the student video cases and implications for pre-service education.

## Introduction

During their field placements in student teaching or graduate field experience, Drexel University pre-service teachers participate in a collaborative weekly seminar, reflecting on their field journal entries and learning more about best practices based in constructivist theories (Wilson, 1996). Participants in the seminar include the pre-service teachers (student teachers and graduate field experience students), cooperating teachers who serve as clinical adjunct instructors, and university faculty. In addition, students' videotapes are studied and analyzed at the beginning and end of their placements. The videos, however, seemed loosely connected to their overall performance goals. What would happen if the students were asked to develop *their own* video cases in the context of best practice, selecting a focus that had relevance and meaning for them? Would learning to see help them learn to teach? Students were asked to select a segment from a videotaped session that had presented a teaching/learning example in the context of best practice. Next, the student was to write a case description of the background context, why they selected this focus, what the audience should look for, and what they planned to do next. They presented their video cases during the seminar meetings.

## Video Case Features

The video case assignment is regarded as an authentic assessment that would "challenge students to apply new academic information and skills to a real situation for significant purpose (Johnson, 2002, p. 165). This approach develops the students' abilities and learning in several important ways. First, inquiry into one's own practice is at the heart of making sense and meaning out of one's individual experience and helps students find their own creative and unique solutions in a collaborative context. Second, students use multimedia tools, such as video, as partners in their inquiry. Through video, a holistic scenario unfolds that facilitates learning on cognitive, sensory and emotional levels (Laurel, 1993). So much of what we learn as teachers is learned through our thought, senses, and feelings *together*. Using video also allows students to "leave a pre-conceived role and to take chances while constructing and deconstructing knowledges through the use of technological partners" (Goldman-Segall, p. 65). Third, developing the video case connected and aligned performance, best practice standards and reflective assessment. Students were now making the connection among the theories and their teaching performance through reflecting on real situations in a critical stance. Fourth, by consciously selecting and developing a video case, students are empowered in their own ways of learning and knowing as reflective practitioners.

## Student Cases

This past fall term, students presented their video cases in the seminar. Several cases were memorable. A physics graduate student discovered how important it was for him to design engaging hands-on experiments and then make adjustments, rather than focus first on controlling disruptive behavior. His video excerpt showed students working on a project at various stages of collaboration. Another graduate student, biology major, showed a video in which students conducted a role-play as an iodine or starch particle in diffusion. As someone who had only lectured before, he was obviously pleased that the students not only enjoyed the activity, but also understood the concepts of diffusion, particle size and weight, and cellular bonding. And finally, a former computer programmer who now teaches computer skills to high school juniors, showed how an emphasis on quality instead of speed was reflected in the students' purposeful work as they moved among their stations. Her follow up plan was to gradually lessen the amount of structure she provided and increase the amount of collaboration. When she presented her video, she was the most relaxed and engaged I had seen her all term.

## Implications for Pre-service Education

Ann Berthoff stated "pedagogy always echoes epistemology; the way we teach reflects the conception we have of what knowledge is and does (1981, p. 11). For pre-service teachers, this gap between pedagogy and a critical examination of one's practice is often tacit and unexplored. It may appear insignificant, but this disconnection often leads new teachers to experience burnout or quit the profession. According to Schon (1987), the prevailing conceptions of many teacher education programs of professional knowledge may not match the actual competencies required of practitioners in the field. He emphasized that prospective teachers must untangle situations that are complex and undefined and impose a coherence of their own making. As educators, we need to give pre-service teachers the time, space and medium for them to investigate their practice intentionally, for the student "has *to see* on his own behalf and in his own way the relations between means and methods employed and results achieved" (Dewey, 1974, p. 151). Developing a video case study is a dynamic way into reflective practice.

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# Practical Experiences: Teaching Preservice Teachers Using Technology

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## A. Objectives or Purposes

A pressing need exists for preservice teachers to become proficient in using technology. Many states have implemented technology standards that identify the skills young teachers need. However, there is no consensus on how these skills should be taught in the university setting. At a public university in North Carolina, a cohort group of interns were exposed to an education course in which instruction was delivered online. The purpose of this study was to evaluate preservice teachers' views toward using technology in this technology rich education course. The course topic was Seminar: A Focus on Exceptional Children. Elementary education majors took the course online and meet once a month to discuss topics of study and to reflect on their experiences during the semester.

## B. Perspectives or Theoretical Framework

Much has been written about the infusion of technology into academic life. Schools are moving at different paces at integrating technology. Varying beliefs about the effectiveness of technology has attributed to the inconsistency in implementing a technologically based curriculum. Concern about the social consequences of technology have driven some to suggest de-emphasizing technology in education (Stoll, 1999), while others have argued that effective instruction, particularly in social studies education, must include a range of computer technology skills (Martorella, 1997). Research studies describe an intensive computing environment as a positive influence on academics (Corwin & Marcinkiewicz, 1998; Geissler & Horridge, 1998; Walters & Necessary 1996). Brown (1999) suggests that technology is an integral part of education in the 21st century.

In a statewide study of the impact of technology, Dirksen, Bauer, Coffland, and Naylor (1998) identified that the computer is an adaptable and versatile tool. They continued by stating that when used appropriately, technology can be a very effective tool. Technology as a tool does not change basic learning processes, but instead it transforms how these processes are developed. To infuse computers in the curriculum, teachers need to be more technology -literate. Teachers' beliefs about technology are often hindered by teachers' lack of technological skills. Difficulty in locating resources and ineffective use of software can inhibit teachers' decisions to integrate technology. Teachers should not only know how to use technology, but they must also know how to effectively integrate technology in their teaching practice and to engage their students in active learning and research (Pan, 1998). Mason et al. (2000), in *Guidelines for Using Technology to Prepare Social Studies Teachers*, suggest that teachers need to learn how to successfully integrate technology to make their teaching better than it would be without it. They emphasize the need for teachers to develop technical skills not just for simply acquiring these skills, but to make them proficient at using technology.

Pan (1998) suggests that in order to infuse computers in the curriculum, teachers should know not just how to use computers themselves, but also how to engage their students in active learning with computers. It is not enough for teachers to allow students to employ technology; they must network with their students and teach them how to effectively apply technology. Trentin (1999) emphasizes along with many others that teachers need specialized technical skills to apply the most appropriate network-based teaching and learning strategies, which usually involve cooperation, sharing, organizing work and study groups, and searching the network to locate significant resources for the educational process.

## C. Methodology

At the end of the semester, students enrolled in the seminar were asked to complete a survey identifying their perceptions of their technology use in the course. The survey was posted online (with a CGI script to encode responses in a text file) and an email message was sent to all students enrolled in the seminar encouraging them to follow the included link and complete the survey. After one week, a reminder email was sent. The survey consisted of 29 questions that were divided into the following categories: Collaboration and Communication, Content Knowledge, Individualized Tasks, Frequency of Use, and Ability Rating. Responses were reported using a Likert scale.

## D. Results

In the area of Collaboration and Communication, students compared this online course to more traditional educational courses that rely primarily on face-to-face instruction. 56% of the students reported that they were somewhat more likely to actively participate in scheduled discussions about the course material, such as a threaded discussion posted on a discussion board. 67% of the students were somewhat more likely to ask for clarification when they did not understand assignments or content and to discuss the ideas and concepts taught in this course with the instructor. 89% of the students stated that they would tell the instructor when they had a complaint or suggestion about the course. 67% of the students reported that they worked on an assignment for this course with a group of other students three or more times during the semester. 78% remarked that they discussed with other students the comments they made on one or more of their assignments or examinations for this course three or more times during the semester. 44% of the students reported feelings of isolation from other students due to the structure of the course.

Content Knowledge was evaluated by looking at the effort required by students to complete tasks and the perceived quality of those assignments. 56% of the students stated that they spent more time studying. 56% of the students felt that they put more thought into their comments. 89% reported that the technology used in this course was appropriate for performing the tasks required. 78% of the students stated that thought the use of technology in this course, they were acquiring skills that will be useful to them as teachers. All students stated that they discussed the ideas and concepts taught in this course with other students three or more times during the semester.

Individualization of the tasks of the course is a major advantage of an online course. 89% of the students stated that taking this course online strongly valued the ability to work though the course materials at their own pace and to complete tasks at times that were convenient for them. 89% reported that they were better able to juggle their course work with work and/or home responsibilities. 89% of the students stated that using technology enabled them to earn at their own pace. All of the students agreed that a benefit of the online course was the ability to see the results of their work almost immediately.

The survey was used to identify how often students were using technology due to the nature of this course. Students were asked to approximate how much time they spent during a typical semester on various activities. 56% reported that they spent ten or more hours per week working on assignments, projects, quizzes or examinations on a computer-based, self-paced instructional program. 67% spent three to five hours per week interacting with their instructor or other students at their institution by way of email or other "time-delayed" electronic communication, such as bulletin boards or discussion lists.

Students were asked to rate their technological ability. Reponses were reported using a scale of one to five. One represented a self-efficacy rating of no knowledge or technological ability and five identification of one's ability as an expert technology user. All students rated their abilities as a four or greater. 56% reported a self-efficacy rating of expert. No students reported feeling at a disadvantage, because they did not possess adequate computer skills.

### E. Implications

The use of technology in teacher education has a positive effect on preservice teachers' learning. Information technology empowers interns to learn more easily, enjoyably, and successfully due to the individualization of tasks. Appropriate experience with instructional technology promotes improved cognitive understanding, content knowledge, problem-solving skills, and basic academic skills (Mayer, et. al., 1999, Soloway, et. al., 1999).

Pedagogy affects teachers' motivations for using computers. Sadera and Hargrave (1998) identified that teachers' epistemological beliefs affect their instructional practices and their conceptions of the role of the computer in learning and teaching. Technology engenders an environment that promotes cooperation and collaboration among students; more in-depth conversations among teachers and students and among students themselves; encourages constructivist classroom instruction; a more equitable distribution of power between the teacher and his/her students; increases both written and oral communication (McGrath, 1998).

Computer experience fosters positive attitudes toward computers (Sadera & Hargrave, 1998). Galloway (1997) conducted a study of teachers to determine their use of technology and how teachers learn to use technology. The results revealed that educators learn to use computers primarily on their own and that it is unlikely that teachers will integrate computer technology into classroom instruction without the inclusion of personal and professional usage. Teachers' motivations for integrating technology into the curriculum, as identified in this article, are dependent upon teachers' experiences with technology and their technical skills. A study by Janice Mitchell and Susan Williams (1993) evaluated the effect of teacher knowledge of technology in the classroom. They categorized teachers into two groups: novice and expert. Their study revealed that experts promoted the use of technology and exhibited a greater confidence in the implementation of technology. Novice teachers did not emphasize the use of technology. The technological knowledge of students depends on the technical savvy of the teacher. Teacher technological literacy is essential in the integration of technology into the curriculum.

Teachers' self-efficacy is defined as teachers' knowledge that they can successfully integrate technology within their curriculum. Teachers' self-efficacy related to instructional computer use fosters flexibility, experimentation, and multiple approaches to using computers in instruction (Dawson, 1998). There is a positive correlation between teachers' technical savvy and teachers' self-efficacy in computer use (Sadera & Hargrave, 1998). Teachers' self-efficacy about their technical expertise will have an effect on whether or not and how they integrate technology in their curriculum Lanich and Meyer (2000). Kurkjian and Sponder (1998) identified attitudinal objectives for effectively integrating technology: teacher motivation to use technology and motivation to develop their skills. Helping teachers enhance their attitudes toward technology involves developing teachers' self-efficacy by transforming their self-perceptions as non-tekkies. If teachers have a high self-perception of their technological abilities, they will be more effective at integrating technology.

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# Getting beyond the preconception of teacher as technology expert

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The Field Based Program at Saint Martin's College has been working with two grants that promote changing the learning environment with technology. The ST2EP grant, is a PT3 catalyst grant, that focuses on creating a learning community that includes pre-service teachers, a team of college faculty, and K-12 students. The Intel grant involves a curriculum for pre-service teachers that encourages the use of technology to include more critical thinking tasks. The grants work together, the ST2EP grant provides an opportunity for our pre-service teachers to work with K-12 students using and learning with technology, while the Intel grant provides support for creating curriculum that includes K-12 students use of technology.

In order to help our pre-service teachers understand how technology can change the way K-12 students learn they need to see and work with those students. Contact with the students, will allow us to test to see if the ideas put forward in either grant can be implemented. Will the pre-service teachers be able to see the advantages of working with K-12 students as the technology experts and themselves as guides to learning. This session will report the findings of this study.

# Preparing Pre-service Teachers in Technology: How Far Should We Go?

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**Abstract**: This paper examines the challenge of determining how colleges of education should prepare pre-service teachers to enhance teaching and learning with technology. With so many different types of software, emerging technologies, and the constraints of the typical K-12 classroom, it is difficult to determine the best content for the "technology course" in a teacher education program. This paper will examine some of these new trends and offer a framework to assist teacher preparation programs in determining the content of the educational technology course. A discussion of how different technologies fit into the framework and how a teacher preparation program's values can help guide the answer to the question: how far should we go?

## Introduction

As NCATE, ISTE, and other national organizations issue the call to teacher education programs to prepare teachers to teach with technology, a new question has arisen: how far should we go? Even as colleges of education work to integrate technology throughout the teacher preparation program, the educational technology course retains the potential to lay the foundation for technology as the students move into their methods and education foundation courses. While the typical educational technology class deals mostly with productivity tools, several new initiatives have developed in K-12 schools that are expanding the use of technology to enhance teaching and learning. These new initiatives are stretching the types of technology tools used and their application in the classroom.

While these new initiatives are exciting, they pose a challenge for colleges of education. With the wide range of options available for integrating technology, teacher preparation programs must make several choices in determining what technologies/applications should be included in the educational technology. Should the focus be on technology as a productivity tool, a medium to foster creativity, or as a catalyst for change? Further, should the emphasis of the program be on preparing teachers for the practical reality of today's classroom or expanding their horizons to prepare them for the potential of tomorrow's classroom?

## Current Trends

Some students in K-12 classrooms are creating web pages, animation with Flash, digital video, and even claymation films. They are using PDA's, probes, digital microscopes, and digital imaging to enhance learning. For students in other classrooms, work with any type of technology is measured in minutes per week. OTEA reports that while the connectivity of US classrooms is increasing, student access is limited. This wide range of access and current use makes a "typical" technology program and infrastructure in a school elusive. This lack of continuity begs the question, "what should we prepare our teachers for?"

The typical "technology course" in a teacher preparation program is often focused on productivity tools. Leh (1999) reports that most courses typically require facility with word processing, databases, and spreadsheets. Many also include work with multimedia presentation software and webpage design. Other courses incorporate digital video editing and production, curriculum integration, and hardware and software maintenance and troubleshooting. With the wide range of capacity and use in K-12 schools, and the varied approaches to technology integration in teacher preparation programs, how can an instructor decide how to best prepare her students for an uncertain future?

## A Framework for Discussion

In order to answer the question of how far we should go, it is fundamental to examine the different focuses of technology and schooling and the different vision and mission of teacher preparation programs. Only then can we begin to determine the content of the "technology course." Different schools and districts have different visions of the purpose of technology and learning. In the current climate, many schools have a keen focus on standards and how to use technology to increase student learning in measurable ways. Other schools see technology as a means to increase the depth of the curriculum and to provide students with an outlet for creative expression. Still others see technology as a way to transform education to be more project-based and learner driven. While all of these approaches are valuable, they have distinctly different views of technology and the learning process. In the same way, the vision and missions of the colleges of education can widely differ. Some programs may put the premium on practical preparation. The goal would be to provide them with the skills, strategies, and methods that will be immediately useful for them as teachers. Other programs may value innovative approaches to schooling within the current school framework. Still others desire to prepare teachers for the classroom of the future.

The choices one makes in these categories greatly impacts what should be taught in the technology course. The chart below offers some suggested course content within each of the criterion cells described above. For example, a teacher education program that values innovation with partner schools who see technology as a way to provide depth into the curriculum might stress the use of mindtools such as databases and spreadsheets to allow students to ask and answer inquiry-based questions.

| | **Standards Driven** | **Depth/Creativity** | **Transforming Education** |
|---|---|---|---|
| **Practical** | Word Processing<br>Skill and Drill Software | Multimedia Presentation<br>Web Page Design | Internet Collaboration<br>Electronic Portfolios |
| **Innovative** | WebQuests<br>Internet Research | Concept Mapping<br>Inquiry with Mindtools | Graphing Calculator<br>Digital Probes |
| **Future** | Differentiated Content-Area Software | Digital Video | Flash Animation<br>3D Modeling |

## Conclusions and Recommendations

While the framework above is merely a starting point of a discussion, it is important that the content of the technology course is carefully considered. In order to make these decisions, it is important to define the values and focus of both the college of education and its partner schools. This can be accomplished by talking with university faculty (methods faculty in particular), teachers, administrators, students, and parents from local schools, and by surveying partner schools on technology capacity and current use. While these conversations can help one arrive at a focus for the technology course, it is probably best to incorporate activities that have a primary focus on a particular area of the chart, while also touching on activities in other areas.

A difficult question like this requires ongoing discussion and different perspectives. To facilitate this discussion, a discussion board has been set up in the Electronic Learning Community section of the PT3 website (http://www.pt3.org) to provide a forum to discuss these issues.

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# Using Formative Evaluation in Teacher Designed Multimedia Courseware

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## Abstract

This paper describes an experience of pre-service teachers using formative evaluation in courseware design. In the module "Learning, Thinking and Instructional Technologies", trainee teachers learned to use PowerPoint to produce multimedia courseware. In the process, they learned basic strategies of formative evaluation and applied them to the improvement of courseware design. The trainee teachers had three weeks to finish their products. By the end of the second week, they tested their courseware on respective target learners. Subsequently, the courseware was revised to incorporate the feedback obtained. Some trainee teachers managed to do the second testing before the final submission. The experience helped the trainee teachers learn the importance of formative evaluation in instructional courseware development, one of the least-well-done parts of multimedia design.

## Using the internet to link preservice teachers to the state and national standards

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As a portal website, IDEAS provides Wisconsin's educational professionals a starting point in their search for resources and materials that have been evaluated for quality and align with the Wisconsin Model Academic and the National Standards.

All the websites have been reviewed by a team of researchers including teachers and university personnel. A rubric was developed by the team to evaluate all resources. After resources have passed this test, they they are tested in the classroom and feedback is provided from these field studies. All the resources are linked to the Wisconsin and National Standards so that a teacher may choose a content area, a grade level and the standards he/she wishes to teach.

Elaine Hutchinson was a part of the initial researcher team in the mathematics area. This presentation will share the rubric and the development of the IDEAS website and use examples of the resources included in the mathematics area.

# Children of the 21st Century have issued this demand: Give us teachers who know how to use technology in the classroom. Are we prepared to meet the challenge?

Gerrie Johnson, Southeastern Oklahoma State University, US

Objective of the Presentation:

The objective of the presentation is to inform teacher educators of the importance of preparing technology proficient teachers who are able to integrate emerging and existing technology into the pre-K through 12th grade classroom curriculum. To accomplish this task, all teacher educators must be involved. Simply taking an educational technology is not enough.

Interactive of the Audience:

Participants will have an opportunity to share their experiences and the policies of the colleges or schools of education in terms of preparing technology proficient new teachers.

Abstract:

Educational systems within our society are experiencing fundamental changes directly linked to emerging technologies and improvements in existing technologies (Matthews, 1998). According to Schank (2000) "Technology is on the verge of fundamentally reshaping the American education system" (p. 43). Colleges and schools of education have a responsibility to prepare a new generation of technologically proficient educators (Krebs, 98). This responsibility was addressed in the 1987 landmark study entitled A Nation Prepared: Teachers for the 21st Century, conducted by the Carnegie Corporation, which proposed reforming the current education system in order to provide opportunities for professional development for teachers, especially the use of technology and the promise it holds for developing new approaches to classroom instruction (Krebs, 98).

Research indicates that teachers teach the way they were taught (Goodlad, 1994). If integration of technology is to occur in education systems, the change must occur within teacher preparation programs, not on an in-service basis once teachers are out in the public schools (Dolly, 1995). The need for training teachers to integrate educational technology into the curriculum is highlighted in virtually all major reports analyzing technology-based instruction (Krebs, 98). Colleges of education must take a leadership role to guarantee that teacher education students experience a full range of the use and application of educational technology. Teacher education students should be required to apply technology to a variety of settings, not just in the context of an educational technology course. They would leave college better prepared to utilize technology in the K-12 environment if they were required to use and integrate technology in a number of

course assignments (Dolly, 1995). It is in this manner that the students will realize how the use of technology can be effective for conveying appropriate content and knowledge to students in the classroom (Knupfer and Zollman (1994).

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# Development of CD-ROM Course Materials: Demonstration of Toolbook Assistant

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**Abstract:** In this interactive session, a short application will be built to demonstrate the power of the multimedia authoring program Toolbook Assistant 8.1 for creating tutorials and case-based simulation instructional materials. This PC-based authoring program was selected as the authoring tool for our university's online learning initiative due to its power as an authoring tool and its ease of use. Toolbook has a drag-and-drop interface that is easy for subject matter experts to use to create high-quality e-Learning content, and comes complete with a wide selection of ready-made templates similar to PowerPoint templates to get a new author preparing instructional materials quickly. The program can make a log of user data that is saved to a disk for verification of learner performance or research.

## Introduction

As teacher educators, we are faced with a daunting task: to prepare special education teachers who have the professional knowledge, skills, and dispositions to meet the challenge presented by the new accountability measures of teacher education and the challenge of working with children of increasingly complex disabilities in the classroom. The teachers of today must pass an application-oriented national licensure exam and be well trained to develop high levels of professional self-efficacy to withstand the demands of the profession, which can result in their retention in the field. Further, from a university perspective, the national report card on university teacher education programs will publish the pass rates for all programs. To meet these multiple challenges, the teacher education faculty in special education must revise its programs to meet the new licensure standards and provide instruction in a way that the pre-service teachers acquire the skills for teaching not at the knowledge level but at the performance level. In redesigning our instruction for the teacher education program, we focused on adding tutorials and case-based simulations on CD-ROM to our web-supported, and our online courses.

## Including Multimedia in the Design of the Courses

Courses were designed using a textbook or a collection of readings as a core knowledge base. Course objectives and resulting content were examined for forms of knowledge (factual to strategies), and intended levels of performance, such as knowledge of higher-order learning skills such as evaluation and synthesis. There was a strong mandate to avoid focusing on knowledge acquisition in the classroom so time could be devoted to developing higher-order skills. Instructors were already using Blackboard a teaching and learning environment that could be used to organize instructional materials, provide forums for discussion and assessments. However, Blackboard-based courses lack the hypertext and media capabilities unless these materials are externally linked to the course interface.

Multimedia materials such as Functional Behavioral Assessments (Liapsin, Scott, & Nelson, 2000), a $79.00 program published by Sopris West were included in the in-class instruction. However, this program required two hours of class time to present and proved to be too expensive to require students to purchase for use outside of class. The cost-benefit of using multimedia programs in out instruction became a critical question to resolve when courses were being developed to be taught online. Once we began designing courses we realized that to match the quality of the courses in which multimedia was presented to the class and to accomplish the ambitious learning objectives needed by our students, tutorials and authentic case-based examples and simulations were needed. This choice of adding multimedia tutorials was validated by Welch and Brownell (2000) who recently developed a CD-

ROM multimedia instructional program and evaluated its use with undergraduate and graduate students. They found significant differences between pre-and posttest scores on content knowledge.

## The Solution: Hypermedia Authoring

The university's technology-based courses were comprised of MS Word documents, web pages and some audio-visual PowerPoint slide presentations. These solutions were not able to match the interactivity standards established by the commercial materials. With a clear understanding of our instructional objectives and very positive experiences with commercial multimedia instructional materials, the course development team examined its course development options. It became clear that to move the course development to the next level, multimedia authoring needed to be part of the course development process. Multimedia authoring involves structuring content in a manner that is consistent with the instructional design: sequential in tutorial direct instruction model applications, and open-structured in constructivist model applications. In the tutorial applications, the metaphor of a book with chapters works well in developing a mental model of the instructional program (Lehner, 1987). Also, in the case-based authentic learning model advocated by Herrington and Oliver (1999) for teacher education there is a need to develop non-linear hypertext learning environments.

In examining the multimedia programs that are used in the classes, the tool used to develop the commercial materials was either Macromedia's Authorware or Director (Macromedia.com). Several of the multimedia programs our faculty found useful were developed as part of federal grant projects supported with hundreds of thousand of dollars in the budget. Additionally, university instructional support professionals did not have the expertise to create multimedia using these programs and certainly it was beyond the expertise the faculty. A problem with university course development is that faculty members are content experts not multimedia authors who work within limited budgets, so the search for an alternative authoring tool using product reviews (White, 1997) led the instructional technology support staff and faculty to Toolbook, a multimedia authoring tool.

## Toolbook Assistant

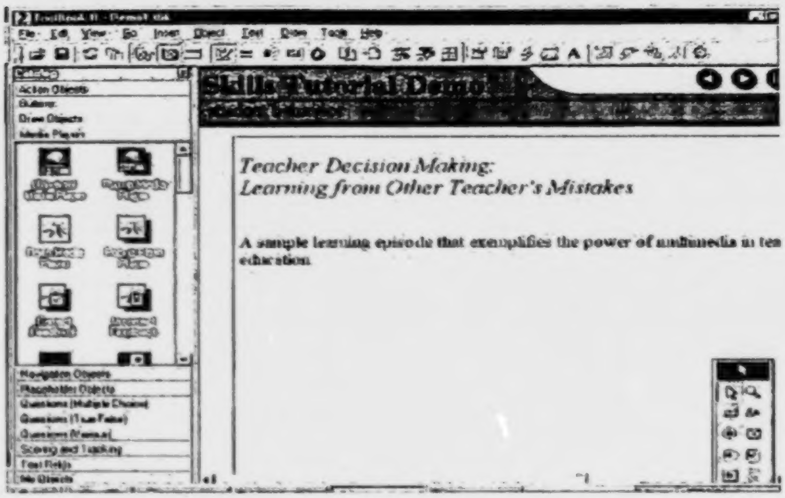
ToolBook Assistant (Click2Learn.com), a PC-based program, was selected as the authoring tool for this program redesign initiative due to its power as an authoring tool and its ease of use. Toolbook uses the metaphor of a book with chapters, table of contents, glossary and pages of content to ease the developer into the process of building multimedia instructional material. The program has a drag-and-drop interface that is easy for subject matter experts can create high-quality e-Learning content. ToolBook comes complete with a wide selection of ready-made templates similar to PowerPoint templates which facilitates a new author in preparing instructional materials quickly. The program contains a catalog of authoring objects (icons) to build your interactive content-assessment objects, media players, navigation panels, and other interactive objects, many with predefined behavior that you can customize. With its WYSIWIG page development, and the ability to toggle from author level to reader level with one click of a key, Toolbook provides immediate feedback to the developer.

From a student accountability and research perspective, Toolbook has a feature equivalent to the Authorware data tracking feature. The program can make a record or log of user data that is saved to a disk. This data tracking information can be used for verification of learner performance or as research data.

The development of multimedia incorporates the five–stage process as outlined by Jerram and Gosney (1995) which end with authoring. The technology used for authoring will in part creates a context to define the parameters of the final project, but does not control or drive the project. For example, once the authoring stage begins for a basic tutorial the faculty member:

- selects a template and a background which is similar to PowerPoint.
- creates or copies page layouts for text and media
- pastes text content into text boxes, and adds audio and video as it is needed to support the instuction
- makes hyperlinks to other pages, or pop up notes
- inserts question objects.

Many of these actions are easily accomplished by dragging preprogrammed objects from a convenient catalog onto the work space as shown in Figure 1. Immediate feedback to the student is accomplished by adding to quiz items. Context-based assistance is accomplished by using branching user paths which can lead to reteaching or additional examples can be placed into the program by answering questions in dialog boxes as the questions are created. The final product can be "packaged" for distribution as read- only files for Windows PC CD-ROM


ToolBook II
File
Edit
View
Go
Insert
Object
Text
Draw
Tools
Help
Catalog
Action Objects
Buttons
Draw Objects
Media Players
Navigation Objects
Placeholder Objects
Questions (Multiple Choice)
Questions (True/False)
Questions (Manual)
Scoring and Tracking
Text Fields
Skills Tutorial Demo

*Teacher Decision Making:*
*Learning from Other Teacher's Mistakes*

**A sample learning episode that exemplifies the power of multimedia in tea education**

Figure 1: Toolbook authoring work space showing catalog of drag and drop items.

or converted to web pages for cross-platform accessibility through a process managed by an autopackaging feature. This process "collects" all of the media and support files, creates folders and places it neatly in a folder that includes an install/setup file and a reader file.

## Conclusions

Toolbook Assistant offers the instructor who has both the content knowledge and interest in working with technology the opportunity to develop multimedia instructional programs for use by students online or from CD-ROM. The data tracking-log file function that makes a recording in the form of a text file on a floppy disk that can be submitted to the instructor via e-mail is especially valuable to faculty who wish to conduct research into learner performance and navigational patterns. The programs developed are easily edited and updated so a small project can be expanded and become more elaborate as formative feedback is received from students. In course evaluations from courses that have included multimedia materials as part of the instructional delivery, the student feedback has been quite positive. Therefore, if instructors wish to go beyond the use of web pages in a Blackboard-like teaching and learning environment and animated audio narrated PowerPoint presentations, consideration should be given to including multimedia authoring tools as an option for instructional material development (Mitchell, 1999).

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# Meeting the Challenge of Teacher Education Through a Technology-enhanced Program of Studies

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**Abstract:** Special education is one of the most challenging specialties within teaching. It provides an excellent opportunity to test the promise of technology to enhance teacher education. As teacher educators, we are faced with a daunting task: to prepare teachers who have the professional knowledge, skills, and dispositions to meet the challenge presented by the special education classroom. To meet this challenge, the special education preparation at Arkansas State University redesigned its instructional design so that it makes full use of instructional technology options for teacher education.

## Introduction

First year teachers have report that their teacher preparation courses do not sufficiently prepare them for the realities of the classroom. Moreover, recent changes in the performance-based teacher examinations have placed more emphasis on application of the knowledge and analysis of situations. As teacher educators, we must find ways to present information and encourage students to process that information prior to coming to class, so class time can be spent on actively making connections between the course content and field experience. The program of studies and courses in special education described in this case study of Arkansas State University accomplished this task and led to increased student learning, satisfaction, and sense of professional efficacy.

## Program and Course Design

The work on program revision began with examining each course for content type according to Gagne's forms of knowledge and Bloom's Taxonomy. Courses that were heavily loaded in content were supplemented with text study guides, PowerPoint presentations that were accessible for review on the web before class meetings. Also, provided were tutorials designed from a direct instruction model that included many instructional supports, such as explicit help in organizing information through content maps, coaching, summaries and immediate feedback on comprehension questions. Due to the extensive knowledge base needed by students as a foundation for engaging in higher order learning, the critical need emerged to "package" content in a manner that would make it available for students to study outside of class. For topics such as Direct Instruction and collaborative consultation CD-ROM hypermedia tutorials were created that had the capability of recording on a student disk the "path" of the student through the tutorial and recording student performance on assessments. Through the use of these tutorials, especially the Direct Instruction tutorial, presentation of content and the demonstration of skills could be accomplished outside of class, so class time was used for viewing teaching clips and engaging in analysis of lesson plans and teacher behaviors.

Courses that involved application, analysis, and synthesis of information to solve problems included case-based situated learning materials. Situated learning incorporates into the learning environment: authentic contexts, authentic activities or problems, multiple perspectives, expert opinion, and opportunities for collaboration and reflection. This instructional design feature is ideally suited for preparing special education teachers, who are learning a body of knowledge and skills that must be applied in a simulated meaningful, complex context, such as a classroom. This situation reflects the context in which the information will be used in real life. These authentic contexts for learning anchored the instruction in reality which facilitated retention and application of the instruction. Langone, Malone and Clinton (1999) compared test scores of preservice teachers taught using either anchored or nonanchored instruction, a form of situated learning. The nonanchored instruction consisted of traditional lectures while the anchored instruction used video-based case studies. While no difference in test scores were noted between groups on tests administered immediately following the instruction, test scores of those receiving anchored instruction given eight weeks later were significantly higher than the nonanchored group. The authors concluded that retention of content was better for the anchored instruction group. The Teacher Problem Solving Skills (TPSS) (Fitzgerald, Semrau, Johnson, Kraus, Nichols, & Standifer, 1996) series of multimedia programs developed and used at Arkansas State University are integral components of the preservice preparation program.

Given this research, the Arkansas State University special education preparation program moved from an information dissemination model with assessments of low-level learning toward a model of instruction focused on higher-order learning and thinking. That is, it shifted from a Reductionist orientation to a Constructivist orientation as the student progressed to more advanced courses within the program (Herrington & Standen, 2000). This made course design very important. Careful consideration was given to the instructional design of courses, activities within courses, and the instructional conceptual framework. The **Instructional Events Model** (IEM) (Rosenshine & Stevens, 1986) was selected to guide our development process. IEM consists of nine elements: a) gaining the learners' attention, b) stating learning objectives, c) guiding the learners through learning activities, d) presenting information, e) coaching through learning exercises, f) facilitating interactions between learners, g) providing constructive feedback, h) assessing learners' performance, and i) promoting transfer of skills to new situations
This selection was validated by research conducted by Welch and Brownell (2000) who recently developed a CD-ROM multimedia instructional program based on IEM design principles and evaluated its use with undergraduate and graduate students. They found significant differences between pre-and posttest scores on content knowledge. The following components were included in our technology-enhanced courses:

1. a comprehensive listing of specific knowledge and skill objectives to establish the expectations for the learning outcomes;
2. an instructor authored commentary for each module and each chapter which serves to alert the student to important aspects of the chapter and provide motivation;
3. multimedia presentations or tutorials of chapter content that include audio and video material to serve as introductions to the chapter before arriving in class;
4. reading study guides which help the student focus on important content;
5. case examples which serve to anchor the information in real-life situations and provide a common experience for discussion and analysis;
6. authentic activities to provide practice;
7. opportunities for in-class and online synchronous discussion using virtual class software;
8. a discussion web to provide a forum for sharing views and publicly reflecting on what is learned and experienced; and
9. on-line quizzes so the student can check his/her comprehension of the content.

## Conclusion

It was the intention of this short paper to expand the notion of the technology-enhanced program and course from a web-based correspondence course to a carefully planned series of web-supported courses containing interactive CD-ROM multimedia tutorials and authentic case-based learning exercises. Consideration should be given to including technology resources beyond PowerPoint lectures and web links to improve student outcomes.

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# Intergenerational Learning: A Model for Teacher Preparation

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With funding from the Preparing Tomorrow's Teachers to Use Technology initiative a consortium of seven rural school districts along with Texas A&M University has designed an innovative approach for integrating technology into teacher preparation programs that allows thousands of minority, language minority, children of poverty and geographic isolation to access teachers that are better prepared to teach in their increasingly high tech classrooms. Through the use of an intergenerational mentoring program, pre-service teachers, university faculty, and K-12 teachers interact with one another to learn best practice and technology integration skills.

The need for institutions of higher learning to prepare students for a technological world is self-evident and is striking in an area that is geographically isolated such as East Texas. Here not only school districts struggle to get qualified technologically savvy teachers to fill classrooms but the university also struggles to provide the technical assistance and ongoing support to a faculty that is just now beginning to embrace technology. Finding technical support and training opportunities in the business world has proved expensive and non-existent when indeed the answer to the dilemma was immediately evident: use the existing pre-service teachers now in the College of Education to provide the assistance to faculty.

Why use a technical assistance group that ranges in age from about 18 to 24 years of age? First we know that this age group is made up of predominately the Net Generation (sometimes called Generation Y). The Net Generation, having grown up with the new technologies, enters our institutions of higher education with a much better comfort level for technology than the existing university faculty who grew up with television and radio. Consequently an "Intergenerational Digital Divide" exists. To compound the problem, a second divide exists in our state: that is, the technology infrastructure gap between public schools and higher education teacher preparation programs in Texas. Texas schools have experienced substantial technology infrastructure changes over the past few years. Colleges of Education, however, are limited in their ability to provide substantial pre-service training in Internet-based technologies so that beginning teachers may take advantage of this increased infrastructure. Rather than presenting exemplary models of technology-enhanced instruction to pre-service teachers, most Texas institutions of higher education are struggling with integrating technology into courses and content areas and in offering of on-line courses.

The design of this PT3 initiative, funded in the first round of funding in 1999, is to address the need for increased faculty proficiency in technology while recognizing the challenge and the potential of the disparity between faculty and students in technology skills. The goals of the project were to facilitate faculty development through both approaches: building capacity and providing tech support. We did this by: 1) developing proficiency of the faculty in the TAMU COE in the use of various instructional and communication technologies (building capacity); 2) developing capacity within the TAMU COE in digital media that supports the NCATE standards and the International Society for Technology in Education (ISTE) (building capacity); and 3) providing support to faculty transitioning to the new teacher training program by providing support in the area of technology support and infusion into the curriculum and coursework (providing tech support).

## Program Description

The Technology Mentor Fellowship Program (TMFP) draws upon successful strategies evolving from programs funded by the Technology Literacy Challenge, specifically the Generation www y program, Gen Y Challenge Grant-Olympia, Washington) and the Profiler and Trackstar tools developed in a partnership with the current High Plains Regional Technology in Education Consortia. Training materials supplied through a partnership with Intel and Microsoft (Gates Foundation) through the Intel Teach to the Future initiative provided additional training and support.

The scope of work for the TMFP is to: 1) Provide teacher education faculty (campus based faculty, cooperating teachers, early experience supervisors) a system for technology training that:

- Provides intensive mentoring and support to faculty, and cooperating teachers in the field from pre-service teachers experienced in the process of integrating technology into instruction at the K-12 level;

- Identifies the growing knowledge base within college and school organizations, among students and faculty, and supports the sharing of both skills and knowledge through collaboration and the development of specific, skill related instructional objects;
- Provides continuous assessment of competence for college and school teacher education faculty, in the area of integration of technology into instruction;
- Provides professional development activities tailored to the particular needs identified by teacher education faculty regarding technology skills/processes for technology integration.

2) Provide teacher education faculty and pre-service teachers access to a repository of instructional objects designed to:

- Develop and use basic technology skills, skills in the instructional application of technology;
- Use technology-congruent pedagogy, such as project based learning and continuous skills assessment;
- Be searchable by their application to specific issues related to the integration of technology into instruction across grade levels, content areas, and national standards.

3) Provide opportunities to organize instructional objects into web-based courses.

Outcomes

The redesigned elementary and secondary teacher preparation programs became fully operational as field based programs during this TMFP initiative. The elementary program has 12 Professional Development Schools (PDS) and 10 Integrated Methods Schools (IMS) that support the preparation of approximately 430 teaching candidates each semester. IMS are pairs of schools that support the field-based teacher preparation programs. All methods classes are conducted on site at the schools. The department head of teacher education has worked closely with the TMFP project staff to provide the equipment and infrastructure to support technology integration throughout the teacher preparation curricula. To example, four "smart carts" have been placed at PDS/IMS schools to enable greater technology integration into the field experiences for our teaching candidates. The smart carts consist of a large heavy-duty movable cart equipped with a laptop computer with Internet card, a digital projector, a VCR, a digital camera, and a PolyComm (2-way audio-video communication system). In turn, TMFP project staff assigned a team of technology fellows (pre-service teachers) to assist the faculty in developing instructional objects for the methods classes and classroom activities in the school. This collaboration will be very significant in sustaining the goals of the TMFP initiative once the funding has been completed.

Early on in the project, logistical challenges became daunting for tracking the large number of technology fellows. Anticipating these challenges, project staff developed an Electronic Management System to track various forms of information and to aide in the data collection. The management system uses the Internet to address challenges associated with multiple levels of communications, project management and monitoring of electronic instructional object development. Profiler has been used to assess and monitor the ongoing progress of all project participants.

One key aspect of the program is the joint-creation of learning objects by faculty and their student mentor, as we believe this provides for support and builds capacity. It is clear that a large number of electronic objects have been created across a wide range of content areas for learners from kindergarten through graduate school. Of the electronic products created, three are directly associated with a n online asynchronous course that was offered during the year.

The initiative offers an extensive professional development program to enable all teacher educators to develop and assess their own changing skill levels for developing synchronous and asynchronous distributed learning systems. It also provides a vehicle for teacher education faculty to develop and demonstrate innovative learning resources, such as web-based learning environments, on-line forums, multimedia project-based learning activities for all components of their teacher preparation programs, and where appropriate, allows for the organization of related digital instructional objects into web-based courses. Findings from this study als o address issues related to intergenerational learning and cross-age teamwork,

# Trainee Teachers Experiences of Using Information and Communication Technologies.

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**Abstract:** This article describes the ways new entrants to science teaching on a one year post graduate training course in a UK university develop the skills necessary to embed Information and Communication Technologies (ICT) into their teaching. This is set within a framework of national personal and professional standards which all trainees have to achieve. The complex process described involves an initial audit of their confidence in a wide range of ICT skills from e-mail to spreadsheets, the use of an ICT in science education portfolio to set targets and monitor achievements, the use of university based and school based tasks and the role of written reflections/assignments. In order to develop a greater understanding of the students' experience of, and attitudes towards, using ICT in the classroom; the students discourses as revealed through their written work have been analyzed and this approach is discussed.

## Background:

In the UK, the notion of initial teacher *education* has been replaced by initial teacher *training* as signaled by having a Teacher Training Agency centrally involved with its administration and inspection. This work-place learning approach or apprenticeship model is reflected in the requirement that student teacher trainees now spend large amounts of their time working in schools. The school based element for a post graduate teacher on a 36 week course leading to Qualified Teacher Status (QTS) is 24 weeks. In the past few years UK Government initiatives have placed ICT at the centre of a skills focused drive within the curriculum (DfEE, 1997c). Minimum standards for ICT in schools have been set by the Government requiring: improvements in resoursing (a computer to pupil ratio of 1:7 for secondary schools; that all schools have ICT curriculum plans; that schools are internet connected with 20% via broadband). In addition individual funding has been provided for all teachers to receive ICT training in order to reach national standards by 2002. Alongside this there is the important notion that student teachers should be ICT competent in the classroom (Davis, 1992 ) and in 1998 the UK Government's Department for Education and Employment issued the 'Initial Teacher Training National Curriculum for ICT in Subject Teaching' (DfEE,1998). This ICT National Curriculum for student teachers is a very prescriptive document and is essentially the same as the standards required for all UK teachers by 2002. It contains 118 separate requirements and is organized into two sections. Section A is 'effective teaching and assessment methods' and section B is 'trainees knowledge and understanding of, and competence with, information and communications technology'. Thus section A is to do with classroom pedagogy or professional development and section B is to do with the student teachers' own ICT competence or personal development.

The concern over the past two years of implementation of this curriculum is that the classroom teachers and the mentors with whom the student teachers would be working for the majority of their time would in most cases only be beginning to explore effective pedagogy themselves ( Bell & Biott, 1997; DfEE, 1997a ; Galanouli & McNair, 2001; Goldstein, 1997) and that an adequate level of resourcing would not as yet be in place (DfEE, 97b). Indeed often schools look to students and newly qualified teachers to invigorate the use of ICT within the subject area (Fisher, 1996). A UK Government survey (DfEE, 2001) indicates an improving teacher confidence and competence, and improvements in aspects of resourcing, but the reality is that the indicators used do not relate to the actual pedagogic impact in classrooms and provide limited descriptive statistics. What is of direct relevance to this paper is that the survey revealed that 51% of the science teachers in the 67% of schools that responded saw ICT as having little or no benefit. This finding is supported by the more general Ofsted report on ICT, which indicated that the general improvements in teacher confidence had not translated into effective pedagogic practice (Ofsted, 2000a) and that ICT was a common omission in science department planning at lower secondary level (Ofsted, 2000b).

The rest of this paper describes the ways this ICT National Curriculum has been implemented within the one year PGCE course at the University of Nottingham in the UK in ways that recognize the varied experiences and opportunities students teachers may have in school. It then explores their understanding of the use of ICT in classrooms by analyzing the ways they describe its use.

## The Framework for Development

Whilst the UK Government imposes rigorous and detailed standards, the ITT providers' agenda of developing reflective, principled and critical practitioners has continued. Support for student teachers in taking ownership of their own personal and professional development has been the general principle underlying the pedagogy used by UK HE institutions. The approach used at the University of Nottingham, which follows a reflective practitioner model (Schön 1987, 1991), recognizes the varying pre-course experiences of the students, the varying range of ICT skills and the differing school cultures in which they carry out their practice. It does this through an auditing process, which involves the ongoing setting of and the monitoring of individual targets supported by the use of a student completed ICT in science education portfolio. However, in order to support the development of effective pedagogic skills, taught sessions and reflective assignments based on observed classroom practice of science teachers, as well as of their own practice, are used.

This process is embedded within a wider approach, which has at its centre a Record of Professional Development (RoPD) of which the ICT in science education portfolio fulfils one small part in supporting student teachers in monitoring their performance. This approach is taken for all the areas of personal and professional development within the wider national framework of teaching standards throughout the course. For science student teachers there are over 400 separate standards for which there must be evidence of achievement to achieve QTS status. These standards are described within the areas of Knowledge and Understanding; Planning, Teaching and Class Management; Monitoring, Assessment, Recording, Reporting, and Accountability; Other Professional Requirements; ICT; Communication (spelling, punctuation and grammar); Numeracy (mental/general arithmetic, applications of measurement, basic algebra, using statistical information).

The RoPD contains all of the targets the student teacher has set through the course within the areas above, together with evidence of their achievement. The process has as its basis SWOT [1] analysis and a SMART [2] target setting cycles which are carried out at regular intervals during the course and are supported by group and individual tutorial sessions. What on the surface may appear to be a burdensome administrative task is critical as the means of raising student, tutor and the supporting teachers in schools' awareness of the student teachers' professional development needs. This information is used in the weekly discussions of student progress with the school mentor whilst the student is in school and is a means of focusing the student on the wide range of ICT and other skills they need to develop.

## The ICT Activities

The framework consists of the components or activities which are carried out in a sequential manner and these are set out in figure 1.

## Evaluation of Personal and Professional Competence

The evaluation of personal competence is achieved through the on-line student teacher completed rating of confidence in personal ICT skills. This measure of their confidence in their use of the wide range of ICT applications available is clearly related to their competence to use these in the classroom. Analysis of the confidence ratings reveals that for most student teachers, competence can be associated with a limited number of applications, e.g. word processing, spreadsheets, email (Fisher, 1998). Experience of data logging or using modeling or simulation software is not widely spread amongst the science group and some mature students have had little experience of anything except word processing. Thus the prospect of having to achieve the standards for ICT which include professional (classroom) practice can be a little daunting for some.

The evaluation of the student teacher's professional competence is on the surface unproblematic. They must go through the process outlined above providing evidence for the achievement of the standards. However what is of real interest is not what they have achieved in terms of the number of ICT lessons taught or how widely read they are in this area, but how they value the role of ICT in the science classroom at the end of their training. It is this that one suspects will be a key factor in their wish to continue to develop this aspect of their teaching. The components in figure 1 provide written examples of their explorations in this area and an analysis of the discourses that these students use to describe what is happening in the classroom form the focus of an ongoing study and a discussion of the approach and some initial findings form the basis of the rest of this paper.

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[1] SWOT analysis is the process of identifying Strengths, Weaknesses, Opportunities and Threats as part of the process of setting targets

[2] SMART targets are Specific, Manageable, Achievable, Relevant and Time-related

| **Phase on the course** | **Component** | **Description** | **Purpose : (All components raise student awareness of achievements and needs)** |
|---|---|---|---|
| Pre-school experience | 1.Initial audit of personal ICT confidence | On-line student completed rating of confidence in personal ICT skills. | To provide whole course information as to student needs. To support the planning of university tutor led taught sessions. To support personal skills development. |
| | 2.RoPD and ICT in science teaching portfolio task. | Students complete a SWOT analysis and set SMART targets at five points in the course. | To support the ongoing development of ICT skills and to provide evidence of achievement of the standards for QTS |
| | 3.University based taught sessions | Students are introduced to the full range of ICT use in classrooms through workshops with effective classroom teachers and their university tutors. | To provide hands on experience for students of using data-logging, spreadsheets, data bases, PowerPoint, Internet, simulations etc. |
| 1st school experience (Teaching practice in school 1) | 4.Observations in school * | Written assignment of the observation and evaluation of two observed lessons that use ICT. This is followed by ongoing observation throughout the time in school. | To support reflection about effective practice in embedding ICT in the classroom. |
| 2nd school experience (Teaching practice in school 2) | 5.Teaching using ICT * | Written assignment involving the evaluation of the students experiences of teaching two lessons that incorporate the use of ICT within them. | To develop professional competence in use and evaluation of use of ICT in the science classroom. |
| Post – teaching practice | 6.Commentary on the use of ICT in the classroom * | Written assignment involving a reflection on classroom practice and through reference to the literature on the value of ICT in teaching and learning in science teaching. | To provide an opportunity to reflect more widely on effective use of ICT . |
| 3rd school experience in school 3 | 7.School Based Inquiry tasks * | Schools request students to undertake a curriculum inquiry project during the final phase of the course. Many of these have an ICT focus. | To provide an opportunity for further development of classroom skills in this area. The projects involve curriculum development, teaching and evaluation as well as a process of communication of the project within school and more widely through a student led conference |
| Post – school experiences | 8.Final audit of personal ICT confidence | On-line student completed rating of confidence in personal ICT skills. | To provide evidence of achievement for students and to support the completion of the final RoPD - the statutory Career Entry Profile. |
| | 9. Final completion of the ICT in science teaching portfolio * | (Written assignment)<br>This contains a description of the UK National ICT trainee teacher standards and the students indicate which they have achieved providing evidence from a range of sources including the tasks above. | To provide evidence of achievement of personal and professional ICT skills for students and to support the completion of the Career Entry Profile which forms the basis of professional development within the first year of teaching |

**Figure 1:** The ICT components (All tasks are monitored and feedback is provided. Those components marked with an asterisk are formally assessed.)

## Analysis of Student Teacher Discourse about ICT in the Science Classroom

The approach taken initially has been to focus on a sample of nine student teachers and analyze their written assignments that relate to their own classroom practice, components 5 & 6 (see figure 1), in order to understand the ways they perceive the value of ICT. Component 5, 'Teaching using ICT', is a student evaluation of their experiences of teaching two lessons that incorporate the use of ICT within them, whereas component 6, 'Commentary on the use of ICT in the classroom', is broader and involves a reflection on science classroom practice with reference to relevant literature. The researcher was their university tutor and thus had extensive professional knowledge of each of them and also of the schools in which they were based and this supported the

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analysis in validating what the students had written. In fact the researcher had observed all of the student teachers in the sample using ICT in the classroom. Discursive psychologists (Wetherall, 2001) claim that people use language to create the objects of which they speak, to position themselves and others, and to make some ideas seem more natural and right and others unthinkable. In this light what student teachers express about their classroom practice in the language they choose reveals their constructed perspective.

## Results Overview

The analysis revealed the issues raised by students and these provided an operational perspective, i.e. they were describing their actual practice in school rather than theorizing about it. However the 'Commentary on the use of ICT in the classroom' did reveal the ways theory was viewed in relation to their classroom practice. The analysis revealed a set of paradigms for use of ICT in the science classroom and these are set out in figure 2.

| **Focus** | **The rationale for the use of ICT** |
|---|---|
| **Curriculum** (Knowledge and understanding) | ***The instructional paradigm*** (Drill & practice, tutorial). Reference was made to the ways pupils were motivated to repeat on-line quizzes in order to improve their performance.<br>***The revelatory paradigm*** (Simulations).<br>***The conjectural paradigm*** (Modeling).Reference was made to the use of spreadsheets and the ways pupils could make predictions and test these out easily.<br>***The emancipatory paradigm*** (Labor saving/allowing time for higher order thinking). The use of data logging was referred to in that automatic graph plotting allowed more time for interpretation.<br>**The modernist paradigm** (modern, authentic, contemporary). This refers to the ways the Internet (and the use of hand-held data loggers) were viewed as being 'modern'. This carried with it the implication that Internet resources were more up to date than text books and potentially more authentic and real. An attractive notion of science and of scientists could be presented, rather than the traditional 'old fashioned' image. (Driver et al., 1996) |
| **Curriculum** (Process skills) | **The experiential paradigm** (Development of ICT skills including information processing and data handling skills, e.g. selecting & summarizing information). This was expressed as providing opportunities for pupils to gain hands on experience of using new learning technologies and developing new skills with minimal teacher intervention. |
| **Pupil** (Generic skills) | **The empowerment paradigm** (Giving ownership of the resource and learning to the pupil). This was expressed as a desire to provide pupils with opportunities to own the resources they selected, to give them a sense of discovery and of bringing something new into the classroom as well as raising pupils' self-esteem.<br>**The professional paradigm** (Allowing pupils to work like professionals, drafting and then producing high quality/professional looking output). This covered the use of presentation packages, such as word processing, paint, spreadsheet and PowerPoint etc. Student teachers' valued the fact that pupils were able to work in professional ways producing professional looking outcomes, by drafting and redrafting, using spell checks etc. raising self-esteem. |
| **Teacher** (Classroom management and organization) | **The pragmatic paradigm** (Choice of use based on practical planning needs). For example, the need for a variety of teaching and learning approaches, the lack of equipment available to teach a topic, the need to make a boring topic interesting, the need to increase the variety of resources available etc.<br>**The impersonal paradigm** (Sensitive topics can be accessed 'privately' by pupils) Coverage of sex education through an Internet site, that provided a range of resources, an animation and an on-line quiz, stimulated a wide range of questions which they were keen to share (confidently) with the teacher. The impersonal nature of the resource was planned to help develop pupil confidence as there was less opportunity for teasing or for feeling embarrassed.<br>**The motivational paradigm** (Teachers recognise that ICT can motivate pupils) The student teachers' all assumed that pupils would find the use of ICT in the classroom a motivating experience. |

Those in italics were first put forward by Kemmes.and reported in Wellington (2000)

**Figure 2:** The rationale for use of ICT in the science classroom

## Conclusions

The analysis of the student teacher's written reflections revealed interesting differences between their perspectives of the use of ICT in classrooms. Most focused on the set of teacher and pupil paradigms as described in figure 2. For them, ICT was perceived of as just another tool to be used within the classroom. It was most often valued in pragmatic and motivational terms rather than being selected, because it was able to deliver the curriculum in a 'better' or value added way. However, this value added perspective predominates the literature in terms of justifying the use of ICT in classrooms. Interestingly, those students who made particular reference to the curriculum focused paradigms seemed to consider the use of ICT in classrooms as something 'extra' of 'bolt on'. Their rationale for use was not described in terms of their more general values and beliefs about teaching and learning, whereas for those who made reference to the pupil focused paradigms this link was explicit. A teacher who awaits the ideal curriculum opportunity for using ICT will not be exploiting its use as widely as the teacher who is taking a more holistic teaching and learning perspective for their rationale for use. Perhaps there is a need for a shift in focus from the curriculum, particularly the knowledge and understanding perspective, to a more holistic teaching and learning perspective when considering the value of ICT in the classroom. This would encourage student teachers to view their use of ICT in the classroom in terms of their own developing models of teaching and learning. A useful tool in this process would be their reflections on their own use early on in their course in that this would reveal the wide range of paradigms set out in this paper; a powerful way of exploring with them the ways ICT fits into heir developing understanding of effective pedagogy. Perhaps if serving teachers could explore their notions of effective teaching and learning and how ICT could be used to support this, there would be fewer thinking that ICT brings little or no benefit to the science classroom.

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# NEW! ISTE NETS Resources for Preparing Teachers to Use Technology

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Lajeane Thomas, Louisana Tech University, US

DESCRIPTION: Session includes samples from *NETS for Teachers: Preparing Teachers to Use Technology* integrating ISTE NETS in teacher preparation foundations, methods, student teaching, and classroom instruction.

SUMMARY: Dr. Peggy Kelly, Co-Director of the ISTE NETS for Teachers Project and Document Development Director with Lajeane Thomas, ISTE NETS Project Director will present sample learning activities from the newly released *NETS for Teachers: Preparing Teachers to Use Technology* book. The document includes standards-based lessons for preparing teachers or teacher candidates to use technology effectively to support learning in mathematics, science, social studies, and the English language arts. Additionally, activities applying technology to support communications, research, problem-solving, concept mapping and other applications cutting across subject areas will be included. The session will consist of an overview of the resources included in the document including specific examples and Web locations where the contents of the document can be located.

The purpose of the session is to reveal model lesson resources based on both the National Educational Technology Standards (NETS) for Teachers and subject area standards. The lessons will illustrate how teaching activities for each content area can be supported by technology thus addressing both the content standards and technology standards within the same learning activity sequence. The underlying goal of the session activities is to provide a framework for establishing new learning environments supported by technology and guided by the national standards of the professional societies. These new learning environments rely on integration of research-based learning theory and on technology as a catalyst for promoting these learning strategies in classroom practice.

Participants will leave with an understanding of the NETS for Teachers and how those standards can be addressed in programs for preparing teachers to use technology. They will receive examples of the learning activities, the Web address where all of the lessons and resources can be found on the Internet, and will be provided with insights regarding how the standards and resource materials can be used to prepare both preservice and inservice teachers to meet the ISTE NETS for Teachers as well as subject area standards.

Resources can be found at the following Internet locations:
http://cnets.iste.org
For further information contact: Peggy Kelly at http://www.csusm.edu or Lajeane Thomas at lthomas@latech.edu

# Removing the Walls: Creating a Virtual Classroom to Link Theory and Practice in Teacher Education

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Abstract: This short paper describes the outcomes of an effort to link field-based practitioners with teacher education students both virtually in the campus-based portion of a course as well as physically in the field-based portion of the course. The objective of the project was to structure an ongoing, substantive, theory/practice-based discussion.

## Project Background

At Indiana State University an upper-division blocked content literacy and general teaching methods course is conducted on campus. This on-campus course also has a lengthy early field experience (EFE) carried out in public high schools as preparation for student teaching. On campus, students are introduced to various theoretical frameworks that are to "guide" their thinking and action as they plan for, render, assess, re-mediate and reflect on instruction delivered during the field experience. As always, one of the primary challenges is supporting movement beyond Lortie's (1975) "apprenticeship of observation" so that pre-service teachers reflectively address student need rather than simply reproducing the practices learned through their twelve-plus years as public school students. In response to this challenge, our efforts focus on "grounding" these pre-service teachers in relevant theoretical frameworks so that as they move into the field experience, they are better able to respond to the diverse needs of the public school students they encounter. Of course, reflection about the link between theory and success in practice (i.e., careful application of a particular learning theory for a given group of students actually does support student achievement) is critical to the ability and propensity to move beyond an "apprenticeship of observation."

Schon (1987) established the centrality of the role of reflection in such professional development. In the context of this course, Zeichner and Liston's (1987) Reflective Teaching Index provides a framework and process that challenges students to thoughtfully connect theory with practice. However, given the centrality of dialogue between pre-service teachers and practitioners as they confront the complexities of practice during the EFE, and the somewhat peripheral role of the university professor during that time, various means of enhancing, or grounding, that conversation to create the reflection required were considered.

As I considered this dilemma, the parameters for its resolution became quite clear. I needed to create a time and space for the reflective dialogue needed, and I needed a way to involve practitioners in my course so that the theoretical frameworks and language used could become common to all. In short, I needed to remove the walls between the campus-based component of the course and the field, and between the professor and the practitioners. My solution, I believed, was in cyberspace; I would create a virtual classroom.

Primarily, the software available on campus, Blackboard's CourseInfo, drove the selection of the environment for my virtual classroom. That environment would not only allow students and practitioners alike access to the required reading materials, but would also provide an electronic forum for discussion accessible only to those enrolled in the course. Because electronic forums are increasingly becoming a viable alternative for supporting reflection (Burley et al, 2001; Kerka, 1998), and this environment allowed the discussion to be fostered in close virtual proximity to relevant theory, it seemed the most appropriate solution for the grounded reflection sought.

## Findings

In terms of usability, participants reported that the password-protected environment was easy to navigate and felt that, because of password protection, the electronic forum was a "safe" and private environment for open discussion. Additionally, having the discussion based on the web rather than "distributed" to participants not only prevented mailbox "clutter," it also provided an environment where a number of topical forums could be established within which a number of related threads would support conversations. Discussants reported that because discussion threads were topically sorted, particular conversations were easy to follow and participation was encouraged.

Preparing participants to enter and dialogue in cyberspace presented differing demands for pre-service and practicing teachers. Pre-service teachers had been engaged in listserv conversations for at least the year prior because of program course requirements. These individuals had been given direction and appropriate feedback concerning online professional discussions. Practitioners were also supplied with the same basic information, though in a manner consistent with their professional stature. Both groups were given direct instruction on the "mechanics" of use of the forum. In terms of transitioning to conversations among participants in cyberspace, there had been face-to-face dialogue between most of the students in the course and the practitioners, and many of the practitioners knew each other professionally. Of course, some of the pre-service teachers and practitioners had never had a face-to-face meeting, but this did not influence online conversations according to participants.

Equipment proved the most daunting challenge. Because of the demands of this course, pre-service teachers had few problems because they had been challenged to locate and keep accessible the necessary equipment. Also, because computer use is such an integral part of completing assignments for most college courses, this was not much of an obstacle. Students reported that the extensive use of the software prior to engaging in the electronic forum helped them feel comfortable with negotiating its use. Practitioners faced more challenges, however. For many, available equipment at the school was not "fast" enough to make communicating with it an efficient use of their limited time. Time limits, once home where more appropriate equipment was available, prevented practitioners from participating more. While a listserv might have addressed some of the access issues, it would not address the privacy issues and would not have provided the organization necessary to make sense of the wide range of topics over which conversations convened.

Nonetheless, substantive conversations did occur. Even with relatively little preparation for conversing, practitioners were astute in finding and addressing pre-service teachers' concerns. Apparently, they are masters of understanding the sub-text, even in cyberspace. Among others, discussion topics included management issues; interface with parents and the community; current trends in curricular approaches; recruitment of students to content areas; career education; supporting "at-risk" students; influences of student's home life on teachers' instructional strategies; homework; graduation testing; tips on effective use of particular instructional strategies within various disciplines; safety in instructional areas; establishing relationships with students; infusion of multiculturalism; infusion of technology; service learning; licensing and re-licensing; sharing of professional information; marginalization of particular disciplines; funding; assessment strategies; teaching across disciplines, etc. In terms of frequency, the "bulk" of conversations occurred during the early field experience (EFE). Post-EFE conversations were few and primarily considered issues of time management, seemingly reflective of students' projections (or concerns) for student teaching. Unfortunately, use of theoretical frameworks and language from the course, the prime reason for establishing the forum, was not supported. Practitioners did not read the course materials primarily because of time factors. However, some of the desired theory was discussed, but the language did not directly reflect that used during the campus-based portion of the course.

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# Connecting Curriculum and Technology: The Integration of Theory and Practice in Civic Education

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This presentation will report the results of a research study conducted during the 2000-2001 school year in a midwest middle and high school. One of the central arguments in civic education is how we can make social studies curriculum work well in a real context: the seamless integration of theory and practice. Web-based instruction (WBI) can help to solve this explosion of problems. In this presentation, I will demonstrate that the best approach to effective civic curriculum development is to synthesize knowledge and skills with actual practice. Guidelines for designing civic education programs using WBI will be explained. Also, detailed methodological issues regarding WBI for civic education will be mentioned. Based on the findings of the research, I will address several future research questions in the last part of the presentation.

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# Design and Practice of the Technology Integrated Teacher Education Program for Parental Engagement

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This paper is to design and implement a technology integrated social studies methods course in order for preservice teachers to have a better understanding for engaging parents into their children's education. The schools are social systems that include parent, communities, and school professional reinforcing each other's efforts to keep students in schools. Especially parents working with schools and community are vital to the improvement of schools and neighborhoods. In this paper, several obstacles in participating in their children's education are discussed. Further, it is argued that these problems are not about knowledge but about institutional settings, social structures, values, goals of the school, and life style. We need to develop a program with an effective communication tool to improve the communication between teacher and parents in a real setting. If the teacher education program does not implement this new method, our future teachers will be limited in their communication skills with all parents. In this paper, a program for preservice teachers is explained.

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# SUPPORTING THE NOVICE TEACHER

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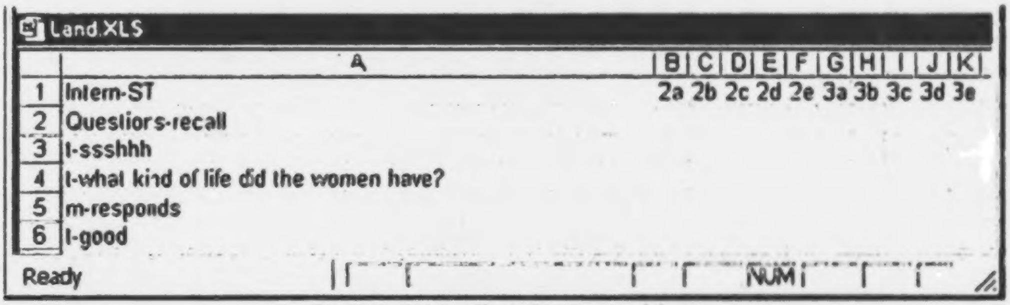
**Abstract**: The field-based undergraduate teacher education program at Midwestern State University has been designed using TxBESS standards (PathWise, FrameWorks for Teaching). We are using Palm computers to collect data based on these standards. Data are collected in the field setting, using spreadsheets, word processing or Learner Profile software (Sunburst). The data are used during post-conferences with student teachers or interns to help in their continual development as teachers. The data will also be used as an assessment of the university's curriculum.

Our undergraduate teacher education program is based on the work of Charlotte Danielson, as presented in *Frameworks for Teaching* and her work at ETS's *PathWise*. The state of Texas has also adopted these standards for first year teacher support. We use Palm hand-held computers with spreadsheets, word processing, and Learner Profile (Sunburst). Standards that will be studied during a student teacher or intern visitation by the university supervisor are downloaded to the PDA. During the visitation, data based upon these standards is collected. The University Supervisor is free to select the type of software comfortable to her/him to collect the data.

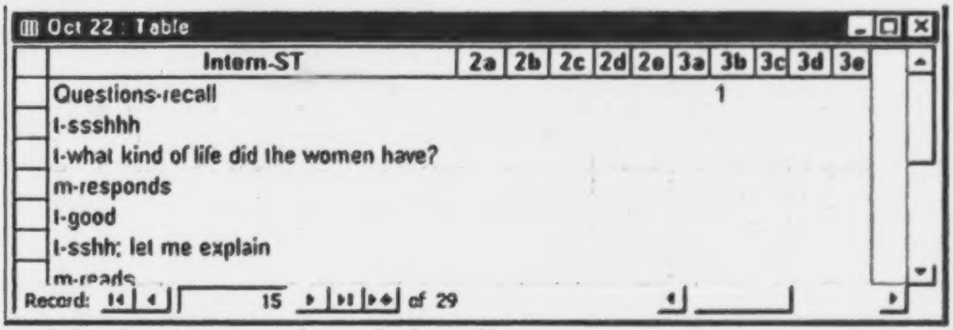
One method used to collect and present the data is briefly described here. The data are collected in the field using a spreadsheet (Figure 1) on a Palm computer. The spreadsheet data can be shared immediately with the intern in either printed or electronic format.



| | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Intern-ST | 2a | 2b | 2c | 2d | 2e | 3a | 3b | 3c | 3d | 3e |
| 2 | Questiors-recall | | | | | | | | | | |
| 3 | t-ssshhh | | | | | | | | | | |
| 4 | t-what kind of life did the women have? | | | | | | | | | | |
| 5 | m-responds | | | | | | | | | | |
| 6 | t-good | | | | | | | | | | |

*Figure 1. Data collected in a spreadsheet.*

Then the data can be easily imported into a database (Figure 2) where they can be categorized, collated by query, and prepared for export.



| Intern-ST | 2a | 2b | 2c | 2d | 2e | 3a | 3b | 3c | 3d | 3e |
|---|---|---|---|---|---|---|---|---|---|---|
| Questions-recall | | | | | | | 1 | | | |
| t-ssshhh | | | | | | | | | | |
| t-what kind of life did the women have? | | | | | | | | | | |
| m-responds | | | | | | | | | | |
| t-good | | | | | | | | | | |
| t-sshh; let me explain | | | | | | | | | | |
| m-reads | | | | | | | | | | |

*Figure 2. Data have been imported into a database table.*

Finally, the category data can be placed into a word processor in a format for discussion by the observer and the intern (Table 1).

| Notes of evidence by Component | Component summary | Notes of Intern Reflection |
|---|---|---|
| 3b: Using Questioning and Discussion Techniques | | |
| Trying to get all to participate; critiques. Asks for cities Ss have generated. These cities are primarily in the SW. Where do you suppose the English/Spanish/French are? | Most T questions elicited factual recall and did not result in discussion. Limited student participation. | |

*Table 1. Data collated by category.*

During the paper presentation, we will share our experiences, as well as student teachers' reflections.

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# Grant Writing for Preservice Teacher Educators Using Computer Technology

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**[Abstract]** In this short paper, I discuss the potential of integrating technology into grant writing to enhance preservice teacher education, focusing on successful grant writing strategies and ways to integrate computers into grant writing.

Preservice educators can enhance the quality of education by obtaining grants for special projects (Bartlett II., Mupinga & Higgins, 2001). However, for many of the preservice teachers, writing a grant proposal to secure external funding is a daunting task. In this article, I discuss the successful grant writing strategies, and ways to integrate computers into grant writing.

## Successful Grant Writing Strategies

*Following the format.* It is paramount to follow precisely the format specified by the grantor. In addition to a title page, abstract, and a table of contents, most proposal formats contain eight components: title page, abstract, introduction/problem statement, goals and objectives, methods and procedures, evaluation, personnel and budget.

*Crafting Proposals.* Merely including the required information in each component does not necessarily mean that funding will occur. Writing a successful proposal often requires following directions as stated below:

Tip 1: *Know your audience.* You must assess your needs and prioritize them before writing a proposal to secure funding (e.g., knowledge of funding agencies). Match your needs to those of the funding agency (Messner, 1996).

Tip 2: *Focus on the details.* Make sure that in crafting your proposal it includes the important elements of title page, abstract, statement of problem, goals and objectives, methods, evaluation, personnel, and budget. The agencies want to know what they are supposed to fund.

Tip 3: *Your proposal must be well written to receive funding attention.* No "ifs" "ands" or "buts"! Try to be as convincing as possible!

Tip 4: *You must be knowledgeable about the core tools of technology to explore your writing strengths.* Go to the word processer, or connect yourself to e-mail and the Internet (Edyburn & Weaver, 1998).

Tip 5: *Stay alert.* Your knowledge of technology can help you participate in the academic community, locate information, and enjoy receiving funding opportunities.

## Integrating Technology into Grant Writing

*Using computers to create documents.* Today, most people use computer technology when creating documents. The computer, with common word-processing software such as Word and WordPerfect, can automatically generate a table of contents, format all headings, and check for spelling and grammar errors. Some funding agencies even require the submission of proposals online (see the Web sites for the Kellogg Foundation [www.wkkf.org] and the Ford Foundation [www.ford.org]). In such cases it is important to follow the instructions for submission, which may include font type and size and proposal length. The major advantage of using technology to create grant proposals is the availability of features such as templates (pre-formatted documents), spreadsheet calculations for budgets, and copying, cutting, pasting and saving as electronic file (Bartlett II, Mupinga & Higgins, 2001).

*Using world-wide web to find potential funding sources.* Preservice teachers can find potential funding sources in directories and in the Federal Register, which are carried by most libraries. These sources, however, though useful, may not offer the most current information. The most up -to-date sources and comprehensive listings of funding agencies can be obtained on the Internet. Because the Internet changes daily, it is essential to use search engines to find new funding opportunities.

Using the computer allows the grant writer to make minor changes and resubmit the proposal to other funding agencies if needed. In addition to Internet sites of potential funding agencies, sites are also available that provide grant-writing techniques and tips. Using this technology to its fullest capabilities will make the process of grant writing easier (Hult, 1992; Moursund, 1995a, 1995b; Dyrli, 1996).

## Conclusion

Grant writing is a means by which preservice teachers at any stage of development come to see themselves as inquirers about curriculum, pedagogy, and educational issues (Gore & Zeichner, 1991). When teacher educators include the grant writing projects in their curriculums, they acknowledge the complexity of teaching and their commitment to prepare teachers who will continue to learn from their own research experiences.

Computer technology has certainly simplified the process of writing a grant proposal. To increase effectiveness and efficiency as researchers, preservice teacher educators are encouraged to exploit the potential technology can offer, to make full use of an integrated desktop of electronic tools to support their work.

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# Technology Training for New Elementary School Teachers

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Abstract: This paper is a report on the development and implementation of a new elementary education program which emphasizes technology integration in all education and methods courses. Observations of teaching and learning strategies used by the instructor and students in the first required educational technology course, interviews, and surveys administered at the beginning and end of the course show patterns of resistance as well as receptivity to new methods and tools for structuring learning environments. The results of this study can be applied to similar programs designed to enhance technology expertise for both pre-service and in-service teachers.

## Introduction

In the National Center for Education Survey of 2000, only one-third of fulltime regular public school teachers reported feeling well prepared to use technology in their classrooms. Many respondents said that they had not received adequate training and needed to learn not only how to work the equipment but how to incorporate technology into their daily lessons (Jones, 2001). Since 1991, the United States has spent more than $19 billion on developing information technology infrastructure for the nation's public schools, with district-level expenditures surpassing $5 billion in 1999. In spite of the growing access to technology, the U S Department of Education calculates that "only 20% of the 2.5 million public school teachers feel comfortable using these technologies in the classroom" (Are teachers, 2001, p.83). Even schools which have adequate equipment report it being underused or not used at all, simply because "teachers do not knew what to do with it" (Harmon, 2000, p.1). Slowenski (2000) reminds us that in order to achieve NCATE accreditation, teacher-training programs must demonstrate a commitment to preparing candidates who are able to use educational technology to help all students learn. Yet, not all colleges follow NCATE guidelines, and as Renwick (1999) points out, eighteen states do not even require courses in educational technology to obtain a teaching license. Teacher training institutions must adjust programs in order to meet the needs of "a new demographic group of students…techno-literates…who expect learning to be fun" and whose parents expect "customization, flexibility, and immediacy" in the learning environment (Wright, 2000, p.37). Our university, which had previously offered only secondary education, responded to the call for creative initiatives by developing an entirely new program for elementary education, with an emphasis on technology. Our experiences with the first class of students to enter the new program demonstrated how a single semester of intense technology instruction can raise the confidence level of future teachers even as it raises their awareness of how much more there is to learn about infusing new classroom technologies into daily classroom instruction.

## The Program

Before writing our proposal to the state asking for accreditation of our new program in elementary education with an emphasis on technology, we surveyed over three hundred elementary school administrators to determine the exact areas of technology expertise they want teachers to have. In addition to expressing interest in hiring new teachers with skills in electronic publishing and instructional software, principals cited a need for teachers who could "trouble-shoot" and solve technical problems wherever they might arise. They also wanted new teachers to be able to assess equipments needs, make recommendations for new purchases, and install and implement new equipment. Rather than re-train existing (and possibly resistant) faculty, these administrators looked forward to hiring new teachers who could bring new knowledge and serve as technical resource persons for the rest of the faculty. In response, we developed a program that would build on the technology requirements already in place for our university's core courses, taught in classrooms which are all equipped with presentation devices (document camera, VCR recorder/players, computer projection systems). The new syllabi we wrote for all elementary education and methods courses require integration of technology into the instructors' as well as the students' planning and presenting of lessons and projects. The college provided funds for a new Education Resource Lab, which contains the following: Dell Personal and iMac computers, a color projector capable of showing images from the computer, a document camera, DVD/ VHS, an overhead projector, LCD panel, smart board, digital camera, digital video camcorder, and an Ellison Press (a cookie cutter for paper used primarily in Elementary school).

## The Students

As we recruited our first class for this new elementary education program, we deliberately sought students who had been leaders in high school, who had demonstrated an interest in working with children, and who had high academic credentials--a minimum of 1000 on SAT and 3.4 GPA; or 1050 SAT and 3.2 GPA; or 1100 SAT and 3.00 GPA. To follow and monitor the progress of this select group and to gather data on the strengths and weaknesses of the program, I audited the first education course taken by our incoming class of twenty-three candidates--ELED 1000, Technology for Education. At the beginning of the term, the instructor administered a survey in order to determine the students' current level of knowledge and degree of comfort in using the technology tools that would make up the course content: e-mail, internet, video camera, digital camera, document camera, scanner, smart board, LCD panel with overhead, desktop publishing and spreadsheet software, using software to import graphics, installing software to a hard drive, putting data on a CD ROM, hooking a computer to a VCR or TV, and selecting software for children. All equipment necessary for learning these tools was made available to students in the newly established education resource center, which students could use during class time and during lab hours, under the supervision of the graduate assistant. A review of initial survey findings shows that the incoming students were most confident with common technologies such as word processing, internet searching, using e-mail, and using a still camera. In the middle range were devices such as the video camera, desktop and spreadsheet software, the scanner, the digital camera, and the slide projector. At the lowest levels of confidence were these skills: installing software to a hard drive, using a document camera, setting up a computer from scratch, and hooking a computer to a VCR or TV. The incoming survey also questioned students about their expectations of the challenges and rewards of the technology component of the new elementary education program. Only four students stated they were "not nervous" about the technology component, but all students agreed that their technology skills will be "very important" in landing a job. The majority of the incoming students described themselves as having "average knowledge of technology." Some students had a previous college computer course, CI 212, but others were taking this introductory course concurrently with ELED 1000.

Of the twenty-three students who entered the course, four dropped out of the ELED program at the end of the semester. The course may have helped students to either solidify their commitment or to realize that elementary education was not their best career option. In addition to differing levels of commitment, the students in this class demonstrated differing levels of comfort with technology. Some had extensive experience with computers and other technologies in their jobs or homes, while others were neophytes. In addition to these gradations, I had expected to find gender differences in the way the students learned how to work with the tools in the education resource lab. My own experience as well as recent reports of the reluctance of women and girls to embrace technology (AAUW, 2000, Eisenberg, 2000, Gehring, 2000) had led me to assume that the mostly female elementary education candidates in this class (19 women and 4 men) would be resistant to working with the high tech tools in the education resource lab. Yet, my own observations as well as interviews with the instructor, the lab assistant, and the students showed that success in learning to operate, manipulate, and un-plug equipment was predicated not on gender, but on the sheer amount of time and effort put into practicing and learning hands-on in the lab. Some students were taken aback by the sheer number of hours required to work through the problems and the assignments. Like tech learners of all ages, they had to accept the absolute necessity for committing large blocks of time to the learning process. Another typical barrier they faced was the technical language, the somewhat arcane acronyms (RAM, ROM), and esoteric words for inputs, outputs, cables, and ports. The students had to develop patience and endurance to forestall the pleasure of using the product until they had carefully deconstructed the time-consuming but necessary steps of the process. The instructor did not explain in class the specific details of how to start up and monitor the working of the equipment. Rather, he spent class time assigning projects, organizing teams and groups, and answering questions. It was expected that students would accomplish the goals of the course by carrying out instructions and completing projects that required them to experiment and practice with the tools in the Education Resource Center, on their own time, under the guidance of the lab assistant.

## The Projects

In one class project, students were to demonstrate various software packages such as *Word*, *Power Point*, *Excel*, and Mail Merge. The student who did a presentation on *Excel* said she spent hours on the formula for figuring out grades using a spreadsheet. The problem she had initially, as she described it, was "I did not pay attention to the instructions…I did not see how I would ever use this tool." While it makes sense to train new teachers before they go into the classroom, without real-world experiences it was difficult for many of the students in this class to fully imagine how they could integrate the new tech tools into learning experiences for future classes. Another requirement of the course had the students evaluate software packages that could be used in elementary language arts, science, social studies, and math classes, following criteria such as the purpose of the software; appropriate audience or age group; the learning this software would support; and possible lessons that could be built around the program. Although they demonstrated competence in installing and running the programs, most of the students lacked the real classroom experience required for making good judgments on how best to use educational software to promote learning. One student reported remembering herself as a grade school learner and others relied on informal observations of young siblings or other children to judge appropriateness. These projects revealed to the students that knowing HOW to use a tool does not guarantee knowing WHEN to use it.

Another major class project required teams of two students to read and study the technical manual that accompanied one of the pieces of equipment in the lab and then to write a set of clear instructions for installing and operating the assigned device. A second team then took the original directions and edited, corrected, or simplified the instructions. The test of both teams' success was the ability of a third team to carry out the instructions as written. The first challenge was to actually take home and read the manual. As one student described the problem, "I read the directions but they didn't relate to anything I know." Like others in the class, he lacked a previous knowledge base into which he could to assimilate the new information. He had to translate the technical language into words he could understand for himself and then recast the information in a set of directions that his peers (not technical manual writers) could follow. The need to explain a complex process forced the students to develop their own teaching and learning strategies. Some students talked through the steps to themselves, while others found it helpful to experiment on fellow students, trying out different approaches and explanations. Students who invested the time and effort eventually learned to cope with the issue of how to demonstrate the workings of a complex mechanism. Using a combination of jargon and everyday language, students learned to describe the properties and appearance of various parts of the equipment, make analogies to more familiar examples, and break up intricate processes into smaller, simpler steps.

Interviews with students conducted in the semester following this class affirmed that the most useful exercise had been the final examination—not a paper and pencil test but an individual interview during which each student had to demonstrate complete, detailed knowledge and expertise with a piece of equipment chosen at random by the instructor (smart board; color projector; differences between a Dell and Mac; digital camera; video camera; scanner; inkjet printer; document camera; zip drive; VCR/ DVD). Some students opted for luck and/or prayer, hoping that they would be given a tool they felt comfortable with. But the most successful students were those who put in at least fifteen to twenty hours in the lab on their own time, practicing setting up and taking down each piece of equipment, and talking through the explanation in front of another student or lab instructor. Students pointed to this practice-with-a-purpose situation as the most significant element of their learning for the entire semester. Working on their own or in small groups, they talked through the steps and instructions and asked each other 'dumb" questions, echoing the ongoing preference of many practicing professionals for learning new technology skills from peers.

## Findings

A comparison of students' own ratings of their levels of confidence before and after course instruction shows a general pattern of improvement in all areas, as well as some unexpected results. Since the majority of students coming into the course expressed a high level of confidence in their ability to use e-mail, surf the internet, or play games on the computer, it not surprising that these items showed the least amount of change in confidence levels from the beginning to the end of the term. Common technology tools such as the video camera, word processing and desktop publishing, which were not the subject of direct instruction in the course but were used by students to accomplish other tasks, also showed little change in the students' over-all confidence levels. One unexpected finding was the lowering of confidence in the ability to "select software for children" from a middle ranking on the first survey to a lower level of confidence at exit. This result can perhaps be explained by the students' new awareness of the many criteria that must be considered (ability of the program to meet lesson objectives, appropriateness for age and ability levels, ease of use, etc.). There were minor changes in the level of confidence in using tools that were not overtly taught in the course but probably already familiar to students, such as putting data on a floppy disk, using software to import graphics, loading software from a disk or CD ROM, using Internet search engines, spreadsheet and database software, and using a still camera. Significant changes for the better in confidence levels were shown for "installing software to a hard drive," "using a scanner," "using a document camera," "using a digital camera." and for "setting up a computer from scratch." Showing some growth but not complete mastery was "hooking a computer to a VCR or TV," still a complex task for most students.

In follow-up interviews, students expressed concern with lack of opportunities to practice using the new tools they had learned in ELED 1000. Although they reported using the Internet, videos, and power point in subsequent classes taught in regular classrooms, they did not feel compelled to return to the Education Resource Lab to carry out projects or just to practice and experiment with the equipment. The department is now reviewing the sequence of courses for elementary education majors, possibly placing ELED 1000 in the sophomore year, when students will also be taking the methods courses that require full technology integration. While the follow-up surveys and interviews showed that students were still "somewhat nervous" about using technology, their experiences in this class made them "nervous" for different reasons. Now they understood the commitment of time and persistence necessary to develop understanding and skill in using various kinds of equipment to enhance learning. On the first survey, only five students had described themselves as "above average" in technology skill, but after the fifteen weeks of course instruction, fifteen out of eighteen students now characterized themselves as "knowing more about technology than most people. "

## Conclusions

Despite expectations that variables such as gender differences and previous levels of knowledge and experience would affect students' progress in their first elementary education technology course, the key to learning the new technology tools appeared to be the students' own motivation to invest time in hands-on experimentation and practice. The challenge of "finding time" faced by our pre-service teachers is evidently shared by classroom teachers who consistently report a lack of released time to achieve the necessary learning as a high barrier to their implementation of technology. "Teachers who spent more time in professional development activities on technology use indicated that they felt better prepared to use technology for classroom instruction than those who spent less time in those activities" (*Teacher's Tools,* 2000, p.102). Even more than money for new equipment, we need to allocate funds to give teachers time and opportunities to gain the level of comfort necessary for them to integrate technology into their plans for classroom instruction. Teacher training institutions and the educational community at large must rise to the challenge put forth by the U.S. Department of Education in *PT3 2000*: "School boards, school administrators, parents, and students will expect all future teachers to be well-prepared, technology proficient educators…who know how to infuse technology tools into the curriculum to improve learning and achievement."

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# Coding Electronic Discussion to Promote Critical Thinking: A Cross-Curricular Teacher Education Approach

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**Abstract:** Acadia University in Nova Scotia, Canada offers unparalleled opportunities to conduct action research on the innovative use of instructional technologies. This laptop institution (the first in Canada) supplies some 4000 students with anytime-anywhere campus access through the use of networked A20m IBM laptop computers. The School of Education, as a teacher training facility, is particularly interested in the pedagogical applications of computers to classrooms. This paper provides the framework for an institutional session on the evolving use of electronic discussion groups.

## Introduction

Electronic discussion has gained a well-deserved place in the arsenal of teaching strategies for the 21st century, particularly in distance education. Since early studies (Harrington & Hathaway, 1994, 1995; Harrington & Quinn-Leering, 1994) it has become clear (Kuehn, 1994) that the asynchronous nature of the electronic discussion group (hereafter EDG) and the accessible transcripts of dialogue, make the EDG a unique phenomena that is decidedly different (Molinari, 2001) from face-to-face (FtF) discussions.

At the onset of EDG use, the obvious application was to allow for an open forum for students to exchange ideas in a relatively unstructured format. Though this model remains prevalent, educators have sought to prime this facile communication to support improved classroom instruction. This has been accomplished by supplementing FtF classroom discussions. As an example, instructors (Joyce, Nodder, & Young, 2001) have used the EDG as a means to 1) extend the classroom discussion by assigning additional topics post-class or 2) preface classroom FtF discussions with readings and preliminary EDG exchanges.

## Coding Electronic Discussion Groups

The EDG offers the added benefit of a recorded transcript of discussion and recently the authors have capitalized on this feature. Though the use of analytical rubrics for assessing EDG's has been explored in distance education, in many EDG settings grades continue to be assigned based on quantity of contributions rather than quality of the discussion. A coding system (cognotes) has been developed (Aylward & MacKinnon, 1999; MacKinnon & Aylward, 2000) for use in EDG's. The cognote system, based on journal coding (Knight, 1990), encourages students to engage in more substantive electronic discussion through a grading scheme that favours higher-order discussion patterns (see Table 1). In this scheme the instructor electronically codes the students captured discussion and then returns the coded work to the student. This promotes critical thinking in that students tend to utilize higher order argumentation patterns which in turn yield a higher grade for their participation (MacKinnon, 2000). Over the duration of several EDG sessions, students have an opportunity to reflect on the quality of their contributions and in ensuing discussions improve their discussion patterns.

| Specific Interaction | Grade | Coding Icon |
|---|---|---|
| Acknowledgement of Opinions (evidence of participation) | 1 | 👉 |
| Question (thoughtful query) | 1 | Q |
| Compare (similarity, analogy) | 2 | ◐ |
| Contrast (distinction, discriminate) | 2 | ⦶ |
| Evaluation (unsubstantiated opinion/judgement) | 1 | ⚖ |
| Idea to Example (deduction, analogy) | 2 | 💡Ex |
| Example to Idea (induction, conclusion) | 2 | Ex💡 |
| Clarification. Elaboration (reiterating a point, building on a point) | 2 | ✂ |
| Cause & Effect (inference, consequence) | 2 | ↻ |
| Off-Topic/ Faulty Reasoning (entry inappropriate) | 0 | ?! |

**Table 1:** Coding Icons (cognotes) and Associated Grading Scheme

## Action Research

The research findings to be discussed are presented in Table 2 in chronological order. The institutional session will map very closely our evolving understanding of the EDG setting and will afford opportunities for in-depth discussions on each of the projects.

| Research Description | Reference |
|---|---|
| 1. EDG analysis in discussions around gender issues in science education (Hemming & MacKinnon, 1999) | |
| 2. "Cognotes" developed, instructor application to secondary science education student's EDG's | (Aylward & MacKinnon, 1999; MacKinnon & Aylward, 2000) |
| 3. The Dilemma of Grading EDG's (MacKinnon, 2000) | |
| 4. Peer coding of EDG's in a Middle School Education course. (MacKinnon & Bellefontaine, 2001) | |
| 5. Using the coding exercise to promote more comprehensive case study reports. (MacKinnon & Bellefontaine, 2001) | |
| 6. Introduction of coding categories to Physical Education students with no numerical assessment. (Pelletier, Brown & MacKinnon, SITTE 2002) | |
| 7. Analysis of EDG's in an Inclusive Education course parallel to the above Physical Education course in an effort to judge transfer without categorical prompting. (Pelletier, Brown & MacKinnon, SITTE 2002) | |

**Table 2:** Chronological Description of our Evolving Research Around EDG's

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# Lessons Learned: The Partnering of Students with Teachers and Administrators to Achieve Successful School-wide Implementation of Learning Technologies

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**Abstract**: Six years ago, Acadia University became the first in Canada to adopt a campus-wide student notebook program. Concurrently, the Acadia Institute for Teaching and Technology (AITT) was created to take a leadership role in the effective use of technology in learning. Soon after, the AITT began translating its growing expertise into training programs for K-12 teachers in Nova Scotia. On campus, the AITT partners exceptional undergraduate students with faculty members in their disciplines to develop learning technologies for the classroom. The success of this experience inspired the inclusion of outstanding secondary students in our K-12 technology training.

This paper will examine the lessons learned from two new programs in which secondary students play an integral part. Sponsored by General Electric, and Clarica, the AITT is in the process of running two 2-year programs that partner teachers and administrators from across Canada and the state of Maine, with exceptional students in their schools. In developing and running these programs, it has become clear that, just as in post-secondary institutions, tremendous gains can be made to both sides of student-teacher partnerships in K-12 schools.

## Introduction

The Acadia Institute for Teaching and Technology (AITT) was established six years ago, as a center for the development of learning applications to support the Acadia Advantage (AA) program, which has since put a notebook into the hands of every faculty member and undergraduate student on campus. Quickly, the AITT became recognized as a center of excellence for the effective integration of technologies into learning, and was funded provincially to train Nova Scotia's K-12 teachers, training over 950 as of fall 2001. The AITT maintains its dual teaching and development roles by employing a large number of students throughout the year. These students are chosen mainly for their people-skills and teaching ability, and are trained in basic applications before being partnered with faculty to support the development of new learning materials, or teacher-training programs. This past summer, the AITT embarked on two new training programs, each of which built on an aspect of our provincial experience. Over 3 years, the Clarica Scholars program will bring up to 60 teams to Acadia, to spend a week developing a technology solution to a learning challenge in their school. The GE Leaders program will fund 14 teams over two years. As in the Clarica program, GE teams consist of two teachers and two students, but with the addition of an administrator. The GE Leaders week is designed to facilitate the creation by each team of a school-wide technology implementation plan. To date, we have hosted twenty Clarica Scholars teams, and seven GE Leaders Teams.

## Lessons Learned

*Empowered by a supportive school, and with ready access to the boundless possibilities of technology, students not only rise to expectation, they exceed it.*

This premise, more than anything else, has made AA a success. Each year, as the story of the program is told over and over again, visitors to Acadia find it hard to believe that students could be relied upon to the extent that they are: as software developers, instructional designers and teachers. Not until some of the student-developed applications have been demonstrated, and the students themselves have described their involvement, is everyone convinced: with guidance, student energy and ingenuity can result in products that not only meet the expectation of their faculty partners, but far exceed it.

The success of technology implementation at any level of education depends on the teacher finding uses for the technology, beyond the obvious PowerPoint delivery of lectures. At Acadia, students not only provide busy faculty with much needed development support but gaining some experience, students also consult with faculty to explore what technology can do for their teaching.

High schools all over North America currently face the same challenge: busy teachers have no time to create innovative applications for their classrooms. In our two summer programs, we met administrators who have already recognised that trying to find time for teachers to first learn the technology and then to work with it, only offers a partial solution at best. Instead, these schools rely on their teachers to be content and pedagogy experts, and to a varying extent, on their students for support and development. For example, at Jakeman All-Grade, in Newfoundland, students worked with their teachers, developing support materials for the classroom. Out of the success of this experience, has come a more ambitious project: a CD-ROM based tour of their town. In order to create this CD, students and teachers have to learn a considerable amount of technology, however, in researching and writing the content, the students are also learning local history, geography and sociology, inspired by the knowledge that their work will benefit a much wider audience.

In another example, at Bonny Eagle Middle School in West Buxton, Maine, 'student assistants' act as teaching and trouble-shooting support to computer lab users.

*It is time to formalise the role of students as technical support to their peers and to their teachers.*

Many teachers feel great trepidation about the unpredictability that arises from technology implementation in their classrooms. Some react by avoiding new technologies all together, while others create powerful opportunities for learning.

At a training workshop for high schools with notebook programs, the question arose: how does a teacher manage both her students' learning, as well as the challenges posed by fickle technology? In response, one teacher described how, while preparing her lessons for the following day, she had tried to incorporate a Microsoft Excel function into a class demonstration. After she had spent some time trying to figure-out the software without success, she decided to put the problem in her students' hands. The next day, she offered bonus points to the first student who could solve the problem, and within five minutes, had given the points away. She had also created a learning environment in which students and teachers are equal contributors.

Similar stories arose, particularly in our GE Leaders Program, where discussions of technology implementation issues included students, teachers and administrators. Clearly, many teachers allow technology to create a collaborative, problem-solving environment in their classrooms. However, students quickly pointed out that although some teachers may not see it, many students expend considerable time, helping themselves, each other, and even their teachers to overcome challenges posed by technology. As two students put it, "I end up spending all of my time helping other people [with the computer] and don't get to work on my own projects." and, "sometimes, I know a lot more than my teachers do."

Believing that students can be formally assigned technology-support roles at their schools, we set-out, in our GE Leaders program, to model how this might be done. We set a few of our programming experts the task of creating situations in which support technologies, such as digital projectors and notebook docking stations, would not function. Our "Student Troubleshooting" workshop, however, did not go as we imagined it would. After having spent less than an hour learning how to confront these situations, the students resolved them too easily and became bored.

As a follow-up to that week, teams (and in many cases, the student members) have agreed to find ways to recognise and reward students' contributions to technical support. When we conduct our 6-month post-survey, we look forward to hearing how each team has accomplished that goal.

## Conclusion

The greatest obstacle to successful implementation of technologies into the classroom is time. Teachers are pressed to learn new technologies as well as to use them in developing solutions to teaching and learning challenges. We have seen that by partnering with students, teachers at all levels of education can not only harness the power of technology to enhance their teaching, but also create a more productive and healthier environment for learning.

# The Educational Technology Minor at the University of Wisconsin-Stevens Point

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Until recently, the education program at the University of Wisconsin-Stevens Point (UWSP) has not been unlike many teacher preparation programs throughout the United States. For example, a recently released report fromthe National Center for Education Statistics revealed that less than a quarter of new teachers reported feeling well prepared to use technology in their teaching. Additionally, the CEO Forum on Education and Technology concluded that many teachers do not know how to put the new gadgetry to good use. The Forum noted that many college teaching programs are 'failing to train the next wave of teachers adequately.' K. Kay, executive director, observed that "We've got to make sure we have a strategy in place in school to bring teachers up to speed to use this technology and make sure we don't graduate another teacher from a school of education who doesn't know how to use technology in the classroom" (Mendels, P. New York Times, 2/24/99).

Recognizing the need to address the issue of improved technology training for pre-service teachers, UWSP introduced the Learning Technologies minor in 1998. The minor, the first of it kind in the state of Wisconsin, is designed to prepare future teachers to integrate technology in their classrooms and to become technology leaders in their schools. The first cohort of pre-service teachers to complete the minor will student teach and begin the search for a teaching position during the 2001-2002 school year.

Concurrent with the development of the minor, the Dean of UWSP's College of Professional Studies worked closely with the Wisconsin Department of Public Instruction (DPI) to institute a Learning Technologies certification category for elementary teachers. The new certification became effective at approximately the same time as the UWSP minor passed through university governance. The DPI is currently considering a proposal to expand the certification to K-12.

The program at UWSP is noteworthy in that it offers a 24-25 credit inter-disciplinary minor in contrast to the single educational technology course offered in many teacher education curriculums. In addition, our program differs from many in that we require that our pre-service teachers begin working with students early in their education, their first experience coming as early as the freshman year. We are convinced that this early and extended field experience serves our students and ultimately their students well. Moreover, the minor contains a strong technical component, including required courses in computing fundamentals, the rudiments of computer programming, and computer hardware and network architecture. We believe that the extensive integration and field experience and the strong technical background provide graduates with the confidence, credentials, and the credibility necessary to serve as effective technology leaders in their schools and in their districts.

The authors developed the Learning Technologies minor and co-teach the minor-specific courses, the curriculums of which are guided by the Wisconsin Model Academic Standards for Information Literacy and the National Educational Technology Standards (NETS). The paper/presentation will describe the minor, the content of the minor-specific courses, provide excerpts from the field experiences, and share the insights gleaned from the experience of our students and graduates working as pre-service technology teachers in the K-12 school environment.

# Unplugged! Pioneering the e-Campus Vision

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Abstract. A technology enriched campus with anytime-anywhere access created a challenge for the Oklahoma Christian University Teacher Education program. An academic environment in which every student is issued a laptop computer creates the opportunity for teacher education candidates to be better prepared to teach p12 students to live and work in a world rich in technology. This happens only when faculty adjust their instructional strategies to model the effective use of technology in teaching their courses. The 4-member panel presentation includes: sharing the Vision of an e-campus; changes in teaching strategies; preparing pre-service teachers to assess p-12 students; and challenges yet to be addressed.

Proposals for change are generally met with excitement and anxiety. The extent to which an individual welcomes or opposes such proposals depends upon the perception of the effect of the change. The availability of and the emphasis on the use of technology in instruction suggests that old ways of classroom instruction are no longer acceptable; new learning must be acquired by the teacher if instruction is to be effective.

## Sharing the Vision.

Change is accomplished only when those affected have an opportunity to participate in the change. When the proposal to create a wireless campus at Oklahoma Christian in which each faculty member and each student would be issued a laptop computer was first considered, most faculty members were using desktop computers and standard programs. In order to involve all groups who would be significantly affected by the change, focus groups made up of the entire Oklahoma Christian University campus community considered the advantages of moving to a laptop environment and recommended the change.

**Technology Mediated Learning**. Such learning requires a change in instructional strategy with the goal of improved learning outcomes. The absence of technology in instruction is characteristic of the receptacle model of learning in which the engagement of students in learning is related to the day and time which the class meets. Engagement is moderately high early in the week and highest in the middle of the week; the engagement level drops dramatically by Friday afternoon. This fact has long been recognized by teachers; it is an aspect of instruction in which change is welcomed.

Chickering and Gamson (1987) articulated Seven Principles of Good Practice in Undergraduate Education: encourage student-faculty contact; encourage cooperation among students; encourage active learning; provide prompt feedback; emphasize time on task; communicate high expectations; respect diverse talents and ways of thinking. Although 15 years have passed and technology has become a major resource for teaching and learning in higher education, these goals still state the desired characteristics of the undergraduate experience and are aligned with the mission of Oklahoma Christian University. The value of using technology in instruction can be assessed by the extent to which it makes these Seven Principles more evident.

Technology mediated learning results in the Discovery Model of Learning. Technology-driven activities such as on-line quizzing, simulations, cyber-shows, collaborative writing, presentation preparation, pre-exam chats, and e-mail engage students in learning before the time of the class meeting. During the class meeting the students are further engaged in student presentations, problem analysis, current lectures, one-minute quizzes, discussion, in-class chat, and case studies. Following the class meeting students complete assignments using discussion board, software demonstrations, on-line guests/videos, Internet research, group web sites, notes on line, and email. By employing these options in classroom instruction, the teacher becomes the facilitator of learning and students are able to be more in charge of their own learning. Students with greater levels of capability are able to move to more challenging levels of learning.

## Changes in Teaching Strategies.

The support for such change is evident in the opportunities that were provided for faculty to learn new programs. Oklahoma Christian faculty received IBM Tinkpads a year before laptops were issued to students. Classes were offered and individual instruction was provided as needed. Thus, faculty had a number of opportunities for staff development before the campus was "unplugged" last August. Continuing support is provided through a "help desk" which provides instant assistance when a technological problem occurs. Support teams work specifically for faculty members; they help faculty work through problems they may be having with new instructional strategies and help them set up new options for use in classes. Ongoing staff development for the individual instructor or for groups in available.

**Preparing Teacher Education Candidates to Assess P-12 Learning.** Teacher education programs accredited by the National Council for Accreditation of Teacher Education (NCATE) must be able to demonstrate how they know their candidates can make a difference in p-12 student learning. One approach which is being used at Oklahoma Christian in an elementary education literacy course addresses the need for assessment over time. This method was chosen because it seemed that it could better prepared elementary teacher candidates to assess student learning in literacy. This approach emphasizes the importance of using authentic child-authored print to practice assessment; it provides opportunity for pre-service teachers to develop an understanding of writing rubrics by using and creating their own rubrics.

***The Assessment Plan.*** All teacher candidates were given access to a prepared writing assessment rubric and authentic elementary student writing samples which were provided by an elementary school in which students complete a literacy practicum. The technology used to distribute the work samples to students included the Digital Dropbox in Blackboard. As an out-of-class assignment, each candidate was given the task of using the prepared writing assessment rubric to asses the student writing sample and make annotations using Adobe e-Book Reader. During class meeting time, completed rubrics were projected for the entire class to review and discuss.

Following this activity, all teacher candidates prepared a writing assessment rubric based upon the Oklahoma Priority Student Skills (P.A.S.S.) The rubric prepared by each student was based on the grade level of the writing sample which the teacher candidate had been given for assessment purposes. Candidates submitted their rubrics electronically via the Digital Dropbox in Blackboard to be critiqued by the professor. The completed rubrics were then projected for the entire class to review and discuss. Teacher candidates with writing samples from the same grade level were grouped together for the purpose of using Blackboard's Discussion Board Forum Page. The purpose of the discussion was to determine particular strengths and weaknesses noted in each grade level.

The final activity was based on an end-of-year writing sample from the same group of students whose work was the basis of the initial activity. Teacher candidates again submitted electronically the completed writing assessment rubrics for e end-of-the-year writing samples; these, too, were critiqued by the course instructor. Candidates working with writing samples from the same grade level were grouped for electronic discussion. The purpose of this discussion was to develop summaries of student strengths and weaknesses in a particular grade level. Teacher candidates then presented the rubric assessment results of their two student writing samples to the class using a projection system.

Other examples of instructional use include materials developed by teacher candidates. The preparation of graphic materials and the use of PowerPoint and Hyperstudio. for designing instruction have been accelerated. The electronic portfolios which are developed by candidates are aligned with the Oklahoma required assessment portfolio standards and serve as the candidate's professional portfolio as well.

***Positive Learning Outcomes.*** The ability to disseminate and collect specific documents through Blackboard was invaluable. The use of class time was enhanced because students worked on projects outside of class. Electronic discussions provided an opportunity to solve problems outside of class and stimulated more focused in-class discussions. The teacher candidates projected a high degree of confidence when sharing their rubric assessment results. Class time was used for refining understanding and application instead of answering simply questions about procedures. At the conclusion of these assessment sessions, students were asked to self assess their learning which occurred through their participation in this activity. The success of the activity is indicated in the results of self evaluations. Students were asked to evaluate, using a scale of 1 to 5, the value of this activity to their preparation for classroom teaching. The resulting evaluation was 4.9

***Seven Principles are Evident.*** Student-faculty contact is encouraged, and prompt feedback is provided because both students and faculty have computer access at any time. Instructors send course information including announcements and reminders of course assignments and provide immediate feedback on quizzes and tests. The nature of technology-driven learning activities such as the literacy activity which has been described encourages cooperation among student as well as active learning. Time on task is emphasized by accelerating learning which precedes and follows class meetings. As students use technology work together to reach consensus and develop presentations for class meetings, cooperation is heightened. This contact will result in a greater respect for diverse talents and ways of thinking.

## Challenges Yet to be Addressed

Pioneering leads to discovery. The e-campus concept has created many new opportunities, but unanticipated challenging issues have surfaced as well. Ongoing collaboration focuses on these issues. What the faculty in Teacher Education have learned may benefit others who may be considering such a change.

Without a doubt, students on an e-campus are more engaged in learning. But practical issues accompany this engagement. For example, students have had to learn how to make the most out of the life of the battery, when and where documents can be printed, and University expectations in using electronic communication. In a laboratory setting, when a computer-related problem was encountered, a tutor was on site to assist or students simply moved to another computer. Now it is their responsibility to contact support personnel and be "talked through" the problem. When students enter the University as freshmen, some have graduated from high schools in which technology was evident in classrooms while others enter from high schools where there is very little technology. Adjusting to university life is a challenge to many; the student whose background in technology is weak can easily become discouraged in an e-campus environment.

Faculty have dealt with unanticipated issues when students use laptops for notetaking and exams. The remedies to problems are there, but faculty must be alert that some students will unwisely choose to play games, to download movies and music and to e-mail friends rather than focusing on the task. Philosophical problems regarding the extent of computer use have been discussed. The University's technology team believed that computers would be used heavily during class as well as outside the class and that this would be an invaluable tool for teachers. The faculty viewpoint was that greater access to computers would enable students to research and prepare information for classes and class projects. Some faculty did not envision the use of computers in the classroom but felt compelled since students were paying increased tuition to cover the cost of the technology.

Several factors are unique to teacher education. If teacher candidates are to remain enthusiastic about teaching, they must be placed in technologically advance p-12 schools for field experiences and student teaching. They need to be able to practice technology-driven instructional strategies which have been developed during their coursework in the e-campus environment. Students who enter classrooms with this level of preparation can often enhance the efforts of classroom teachers who may themselves be struggling with technology. The teacher education faculty must be involved in the p-12 classrooms working with teachers in order to remain current on p-12 technology issues. The university can and may be expected to "repay" schools for providing field experiences for candidates by offering technology-related staff development for their teachers.

Indeed the e-campus environment has been a learning experience for students and for faculty as well. The positive aspects are evident; the negative aspects can be overcome.

# Through the Looking Glass: Preservice Teachers Vision for Technology Use in Classrooms of the Future

Presented by
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**Introduction**

The 1995 Office of Technology Assessment (OTA) report, Teachers & Technology: Making the Connection, addressed that "technology is not central to the [typical] teacher preparation experience" and that "most technology instruction is teaching about technology ... not teaching with technology across the curriculum" (p.165).

Teacher education preparation programs are constantly striving to produce "up-to-date" teachers that are knowledgeable in state of the art teaching practices, classroom management techniques, and technology integration. Yet, what technological tools and skills must be integrated into teacher preparation programs in connecting the classrooms of today with preparing learners for the societal technological needs of tomorrow?

Innovative teacher education programs must go beyond a commitment to technology and best practices in teaching. Beck and Wynn (1998) emphasize that a shift must occur to implement technology applications from supplementary to central in university coursework learning activities. We must begin with a closer look at our learners and match university curriculum opportunities with actual learners needs.

**Presentation Objective:**

This presentation shares an investigation of undergraduate education students' visions and perceptions of their use of technology and its importance in teaching. Presenters will provide examples of student vision statements of technology use in classrooms of the future and how these visions compare to perceptions of technology skill proficiencies they have acquired in their undergraduate teacher preparation programs. Powerful insight is gained on the need to align curriculum goals with technological competencies in teacher preparation programs to better prepare teacher for tomorrow's classrooms.

**Project PICT**

Data collected during the first year of Project PICT (PT3 grant) provided preservice perceptions and visions. "The overall goal of Project PICT is to enable preservice teachers to fully utilize modern technology for improved learning and achievement in their future classrooms." Collaborative efforts among university faculty (education, and arts & science) and the k-12 are providing the tools and training to restructuring and infusing technology that is meaningful and in the k-12 teacher preparation process.

**Method**

**Participants**

Over 450 undergraduate students in the College of Education and Human Development at Bowling Green State University enrolled their senior year of their programs completed a pre- post questionnaire that provided insight to the students perceived proficiencies in 1) the use of technology, 2) technology that students observed faculty in using during their courses and 3) technology that students used within their coursework.

**Design and Procedure**

A pre / post questionnaire was administered to the students during the first two weeks of the semester, prior to begin class assignments or interaction with technology, and again at the end of the semester, to measure the impact of technology during taking their course. The questionnaire was designed to measure perceived proficiency in the use of technology, various types of technology that students saw their professors use within the class, and various types of technology that they had used within their class.

**Findings**

Common threads and themes were among the visions of preservice educators. Below is an overall snapshot of how preservice educators envision the use and importance of technology in their classrooms in the future:

> The goal of using technology, as an instructional tool is to give students an opportunity to have access to a wealth of information beyond what we cover in the classroom to enhance learning and offer different approaches to learning. A technology rich instructional approach would be implementing different types of technology into the classroom across the curriculum. This could be done through various assignments both in and out of the classroom utilizing a variety of up- to-date equipment and programs as teachers will be knowledgeable about equipment and model its

uses. The use of technology in the classroom should be introduced by kindergarten continuing through high school and college with age appropriate hands on activities.

Preservice teachers describe how technology will be used within the classroom in which they will be teaching:

> In a technology rich classroom, I envision both the teachers and students having access to and using computers along with other technology to gather information and as uses to reinforce and support their ideas. Classrooms should be equipped with three to five computers and ideally a laptop on every desk, as access needs to be available for all students on a regular basis. Students need to be given time to learn about and use technology. Technology that is important and necessary for a technology rich classroom would involve computers, word processing, Internet, email, spreadsheet, drawing and graphics, television, electronic references, presentation software, digital cameras, video and multimedia.

Interesting enough, this same instrument (pre/post questionnaire) provided supporting evidence of preservice teachers perceiving their own use of technology as minimal.

**Lessons from the Looking Glass**

Given an opportunity to reflect and look at self-competencies in using and integrating technology in the classroom preservice teachers shared that they believed that they had minimum basic computer skills, yet their vision and importance indicate high emphasis. This seems such an injustice for preservice teachers, almost in completion of their teacher preparation program, stepping into their final student teaching experience to have such a low perception of their own technological ability.

Perhaps after identifying such discrepancies, it is now time for teacher education preparation programs to stare into the looking glass and systematically begin to fill the gap between curriculum, visions, and actual preservice teachers' technological skills that can and should be obtain during their teacher education programs. In order to create innovative and technology rich classrooms of the future we must first prepare innovative and technology proficient teachers.

**In this session, participants will:**

- Explore preservice teacher perceptions, competencies and their implications for teacher preparation programs.

- Exchange through an open discussion, other technology tips, strategies, and innovative curriculum restructuring that enables the use of technology throughout teacher education preparation

Participant Outcomes:

Through the implementation of technology, participants will be able to generate ideas and projects that meet their specific needs of their programs and provide the learners within these programs with choices and activities that will enhance the infusion of technology into teacher education.

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# Creating a Learning Community: Faculty/Student/Librarian collaboration at Washburn and Kansas Universities

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This paper reports on a pilot project implemented during the Fall 2001 semester at a small liberal arts university (6500 students). Approximately 30 Educational Technology students have 3 weeks to develop an annotated resource list as part of a class assignment and a further 6 weeks to develop the resource list into a unit of work suitable for use in their classrooms. The students, all education majors, vary in specialization from pre-K through High School and include every subject area. They were given a "one-shot" library instruction session at the beginning of the project and then were paired up with one of five instruction librarians. The students will meet with their librarian twice in a one-on-one research consultation, and then submit their list of resources to their librarian for grading. The students were also paired with a student from the western civilization program at the University of Kansas. The collaboration between the Washburn University (WU) and Kansas University (KU) students was to be carried out totally through email. Data will be gathered from pretests and posttests administered to the students and the librarians and anecdotal reports will be solicited from all participants. The project will be repeated in the Winter 2002 semester, and results compared with Fall 2001 data. Among the goals of this project are: improving students' information literacy skills; promoting the librarian as a valuable resource; librarians learning about the needs and research habits of today's students; creating mutually beneficial faculty/librarian/student partnerships. This report will present findings, learning experiences, and suggestions for future projects.

# A Study of Developing Reflective Practices for Preservice Teachers through a Web-based Electronic Teaching Portfolio and Video-on-demand Assessment Program

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**Abstract**: Web-based electronic teaching portfolios and videoclipped teaching episodes using by Video-On-Demand(VOD) System can serve as devices for reflective inquiry and self-assessment by preservice teachers during the student teaching semester. Carefully structured procedures in a web-based electronic teaching portfolio and VOD Assessment Program can assist preservice teachers in developing the pedagogical knowledge and skills necessary to effectively plan, implement, evaluate, and manage instruction. Adequate orientation and training in the program will enable preservice teachers to engage in the reflective processes of observing, analyzing, and evaluating their teaching performance. Carefully designed procedures can result in the videoclipped teaching episodes being utilized as effective tools for the improvement of instruction rather than simply a souvenir or memento from the student teaching semester. This paper presents the web-based electronic teaching portfolio and VOD Assessment Program employed in the Center for Educational Research and Practice of Shiga University in Japan. The Program has been a valuable tool for helping education majors make the transition from student to teacher.

## Introduction

The importance of developing in new teachers the ability to reflect on their practice of teaching has been well-established (Posner, 1989; O'Donoghue, 1996). Several studies (Freiberg, Waxman & Houston, 1987; Freiberg & Waxman, 1988) indicate that reflecting upon teaching during student teaching can enhance the repertoire of pedagogical knowledge. Koorland, Tuckman, Wallat, Long, Thomson & Silverman (1985) state that self-assessment may be the key to creating better student teachers. Teacher education programs need to encourage preservice teachers to initiate self-assessment that will develop the type of reflection necessary for a prospective teacher to continually evaluate and modify instruction within the classroom. Most preservice teachers rely on cooperating teachers and university supervisors for constructive feedback on their teaching. Observations and evaluations conducted by cooperating teachers and university supervisors are the most common sources of data during the student teaching experience. Unfortunately, due to the limited number of observations and conference sessions generally conducted, depending solely on outside sources for feedback on instruction may inhibit professional growth. Student teaching is the capstone event of the education program and it is extremely important for preservice teachers to receive as much feedback as possible during this experience. The data provided preservice teachers should be drawn from a variety of sources to complement the feedback provided by college supervisors and cooperating teachers (Freiberg & Jerome, 1988). Encouraging preservice teachers to effectively assess their own teaching will help them overcome weaknesses and maintain strengths. Preservice teachers are capable of analyzing their own teaching, want to improve their teaching skills, and would be willing to evaluate their own instruction if they had the resources (Oliva, 1988). Preservice teachers will be in a position to critique their own classroom instruction if they are provided appropriate background and experience. In order for preservice teachers to effectively assess their own teaching, accurate data must be gathered. This data can be acquired through journals, logs, portfolios, audiotapes, and videotapes. Research supports the use of videotaped teaching episodes to foster self-assessment and enhance teaching performance (Sparks-Langer & Colton, 1991; Struyk, 1991). Simply videotaping preservice teachers and having them analyze their teaching without a systematic set of procedures or background and training in the process will be ineffective. Carefully structured procedures need to be established that can assist preservice teachers in developing the pedagogical knowledge and skills necessary to effectively plan, implement, evaluate, and manage instruction.

## A Web-based Electronic Teaching Portfolio and Video-on-demand Assessment Program at Shiga University

The following information summarizes the process established at Shiga University to utilize a web-based electronic teaching portfolio and video-on-demand assessment program in order to encourage reflection and self-assessment by preservice teachers. It has been developed to enable preservice teachers to engage in the reflective processes of observing, analyzing, and evaluating their teaching performance.

### Course-Embedded Instruction on Reflection, Self-Assessment, and Videoclipping

The research supports methods course-embedded instruction for self-assessment. A study by Jensen, Shepston, Connor, and Kilmer (1994) indicated that preservice teachers could benefit from more instructional experience with videotaping, self-assessment, and reflection in general. The more familiar students are with assessment measures and the more exposure they have to both self-assessment and assessment by supervising teachers, the more competent they will become (Thomson, 1992). The use of videotaped teaching episodes as an instructional tool in teacher education methods classes prior to student teaching enables preservice teachers to be more self-confident and effective teachers (Thomson, 1992). Although elements of effective instruction are reviewed and discussed in all education classes at Shiga University, a more intense study of effective teaching and appraisal systems is undertaken in methods classes. Carefully developed inventories that are based on behaviors associated with effective instruction are examined. This information is linked with assessment activities conducted in the methods classes. Former students have granted the Education Department permission to use their videoclips on the web in education classes for instructional purposes. Methods class students view and analyze videoclipped teaching episodes to compare with known principles of effective instruction. They are taught to assess procedures and consider alternatives, identify and offer changes for nonproductive routines, and think about ways to improve on the lesson. Once students have become familiar with assessment terminology, the next logical step should be the implementation of the terminology in real class situations that are videotaped for self-assessment (Thomson, 1992). Education methods classes are sequenced and clustered in order to block time for team teaching and field-based experiences. Coordinated with methods classes (currently Language, Arts, Social Studies, Mathematics, and Science) are field experiences that provide students with an opportunity to relate principles and theories learned in class with actual practice in schools and allow students to present lessons to students in elementary classrooms. During this field-based assignment, students (assigned in pairs) are videoclipped at least once for each subject area and are required to complete reflection questionnaires for each episode. Methods class instructors view the videoclip on the web with the students and guide them in methods of self-assessment. Although this process is time consuming for the instructor and students, early feedback on teaching skills during methods classes results in better preparation and success for student teaching (Rogers & Tucker, 1993). Students believe this instruction prepared them to effectively monitor their practices and make adjustments to them during the professional semester.

### Student Teaching Semester

Preservice teachers participate in a eight-week, full-time student teaching semester in the Shiga University attached school district. They are generally assigned to one cooperating teacher who has completed workshops or classes in supervision provided by Shiga University. A full time college supervisor is also assigned for the entire experience. The first week of the professional semester are spent on campus for orientation activities. As a part of orientation, guidelines associated with effective instruction and self-assessment techniques that were examined and applied in methods classes are reviewed to encourage preservice teachers to make critical decisions regarding their instructional effectiveness. Preservice teachers also review the procedures and expectations of the Video-on-demand Assessment Program.

### *Videoclipping Procedures*

Attached school districts that accept Shiga University preservice teachers support the videotaping of instruction. The districts' only requirement is for permission slips to be sent home to parents/guardians prior to the taping. Students that did not return permission slips are kept out of camera view. Availability of cameras is not an issue since the Education Department has three cameras, most schools have at least one, and many students have their own cameras. The cooperating teacher, another student teacher in the building, or the college supervisor, can conduct videotaping. Preservice teachers are required to videotape a minimum of three lessons over the eight-week period. The first videoclip is to be completed by week two, the second by week four, and the final by week six. This timing and number of videoclipping allow for early interventions and opportunities to assess growth and determine areas that need improvement. Preservice teachers are advised to videoclip a lesson that will give them an opportunity to analyze and reflect on the effects of their teaching, see [Figure 1]. The length of time for the videoclipping varies with the type of activity and grade level but normally runs from thirty to forty minutes.

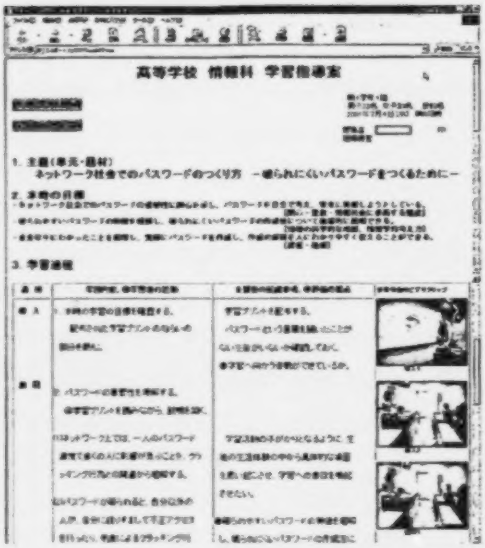
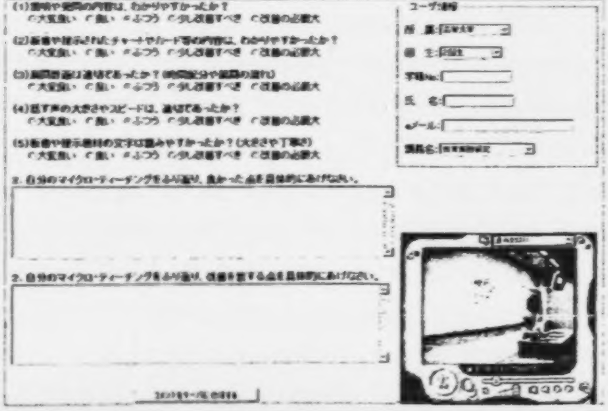


**Figure 1: A Web-based Electronic Teaching Portfolio with Videoclips.**

### *Reflection Instrument*

Preservice teachers complete the same reflection instrument used in methods classes. This instrument incorporates generally agreed upon language derived from the effective teaching literature that clearly describe observable teacher behaviors. The reflection instrument focuses on three major areas of instruction: (1) Classroom Environment; (2) Communication Skills; and, (3) Teaching Procedures. The instrument contains specific items to be rated and open-ended questions that enable the individual to analyze and reflect on their practice, assess the effects of their teaching, and improve and refine their instruction. Preservice teachers rate specific behaviors as either Proficient (Effectively demonstrated the skill well above the required level), Satisfactory (Demonstrated a steady performance and effectively met the standard requirements), or Improvement Needed (Demonstrated some competencies but improvement required). An example of an item would be: "Activated students' prior knowledge and linked this to new information." Open-ended questions for each area (Classroom Environment, Communication Skills, and Teaching Procedures) include, "What do you perceive as the most positive aspects of your teaching procedures?" and, "In the area of classroom environment you are not satisfied with, briefly describe strategies you will consider for improvement." Two additional open-ended questions focus on growth and considerations for additional improvement: "In what specific areas of instructional skills or classroom techniques assessed in previous videoclipped teaching episodes or observations have you shown improvement? Briefly describe how you accomplished this." And, "What specific areas of instructional skills or classroom techniques will you focus on for the next videoclipped teaching episode or observation?" Preservice teachers are directed to view the videoclip at least three times to focus separately on each area when completing the instrument. The completed instrument is reviewed in conferences held with the college supervisor or cooperating teacher and serves as a guide for areas to focus on in the next videoclip or observation, see [Figure 2].



### *VOD(Video on Demand) Conferences*

Preservice teachers have indicated that optimum learning from the videoclip occurred when the student and college supervisor viewed the videoclip together and discussed

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the assessment in the context of the lesson being watched. This dialogue between the student and supervisor provided a smoother transition between methods classes and student teaching, resulting in better understanding of the evaluation process and a more positive attitude toward the student teaching experience (Thomson, 1992). Moore (1988) found it imperative that the videotaped lesson is cooperatively analyzed by the preservice teacher and college supervisor. The main purpose of the preservice teacher/ college supervisor VOD conference is to promote the preservice teacher's ability to reflect upon his or her own teaching and guide them in considering their own methods for improving instruction. This conference gives preservice teachers time with the supervisor to verbally analyze their own practice and effects on students, generate alternative strategies to use, and commit to self-examination and self-improvement. A college supervisor/ preservice teacher conference always follows the first and second videoclipped teaching episode. The progress and ability of the preservice teacher determine a conference for the final videoclip. Most of the cooperating teachers that have been assigned Shiga University student teachers have completed a five credit, tuition-free graduate course, Supervision of Preservice Teachers. In this course they become familiar with the Video-on-demand Assessment program and are encouraged to view the videoclips with the preservice teachers, see [Figure 2]. Through video-on-demand conferences with the college supervisor and cooperating teacher, preservice teachers receive guidance and direction for reflecting on his or her practice. This is also a time for everyone to consider areas to be focused on in the next videoclipping or observation.

**Figure 2: VOD Conference with Web-based Open-ended Questions.**

## Conclusion

It is clearly evident the time required by all individuals involved in this process is extensive. However, preservice teachers and college faculty consider the experience worth the time (Blake, Foster & Hurley, 1996; Holodick, Scappaticci, & Drazdowski, 1999). Although the primary purpose of videoclipping preservice teachers is for the improvement of instruction, the practice is also encouraged by some organizations. Not only the National Board for Professional Teaching Standards in USA (1997) but also some Prefectural Board of Education in Japan requires candidates to submit a portfolio as part of the application process for the certification. It is suggested that candidates include in the portfolio four or five classroom-based exercises (may include videoclip of classroom interaction or discussion) and written analysis of the teaching reflected in the videoclip. If colleges of teacher education are going to prepare highly effective teachers who are capable of evaluating their teaching in the light of student learning, the time must be taken to provide education majors with the necessary training and experience in this process. Shiga University places a high priority on developing a preservice teacher's ability to become a reflective practitioner. Time is committed to learning, experimentation, critical analysis, and practice of skills necessary to effectively reflect. The videoclipped teaching episodes are utilized as effective tools for the improvement of instruction rather than simply a souvenir or memento from the student teaching semester. The Web-based Electronic Teaching Portfolio and Video-on-demand Assessment Program in Shiga University has been a valuable vehicle for helping education majors acquire the knowledge and skills required for professional development and a successful transition from student to teacher.

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# Electronic Reflection in Teacher Education

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## Purpose

This session explores how reflection is shaped by the context in which it occurs. The author will share data from two years of prototyping a reflective, standards-based electronic portfolio with preservice teacher education students. Findings indicate that students' inability to reflect beyond a technical (Cruikshank, 1985) or descriptive level may be, at least in part, due to 1) lack of experience in writing in electronic hypermedia environments and 2) the tensions between the inherent messiness of reflection in learning to teach contrasted with the highly glossy "finished" look of electronic publishing. The research question guiding this inquiry was, "In what ways does the process of reflection change in a hypermedia environment"?

The session will include findings from this research as well as sample student work.

## Background and need for study

Due do concomitant national and international teacher education initiatives, namely performance based assessment and educational technologies for teaching and learning, the implementation of electronic or digital portfolios as a major means of assessment is growing. The recent Preparing Tomorrow's Teachers for Technology (PT3) grant competitions sponsored by the Department of Education have resulted in a nationwide technology focus in teacher preparation institutions. Many PT3 institutions are exploring electronic portfolios as a major grant initiative.

By June 2002, my university is mandated to have in place a performance-based Unit Assessment Plan (UAS) approved by the state. Our institution has identified student electronic portfolios as one performance assessment instrument for demonstration of multiple competencies. In recent years, a number of portfolio types have been used on our campus by faculty from a variety of disciplines. The medium of these portfolios has included paper, PowerPoint, and the World Wide Web. The specific purpose of the portfolios has varied according to the needs of the discipline and the preferences of the faculty member teaching the course.

The electronic portfolio has emerged as a tool to assess students' competencies in technology and other areas. We believe that engaging in the electronic portfolio process will help students to develop technology-related knowledge and skills. The overall goal for the electronic portfolio process is to meet the learning and competency objectives of the program through a student-centered reflective process that ultimately benefits all stakeholders. Given the longitudinal nature of the student portfolio, reflection will become more rich and complex as students continue in the program providing quality information that can be used to examine growth and progress over time. Primary in each stage are students' reflective self-evaluations of their progress and readiness to move on. Building with their first education course, candidates will offer an evolving portrait of their growth as prospective teachers, supported by hyperlinked artifacts that demonstrate and exemplify this development.

### Portfolios as Alternative Assessment

Reform efforts beginning in the 1980's advocated for alternative assessment in teacher education.. The introduction of portfolios, and other forms of performance-based assessments, reflects an increasing dissatisfaction with traditional assessment methods, which do not attend to process and authenticity. Portfolios emerged as a popular tool and are supported by principles such as providing a new perspective on learning, developmental in nature, and involve self-evaluation or reflection. Thus, portfolios in initial teacher education align with constructivist learning theory

### Reflection

Dewey (1933), is acknowledged as a key originator in the twentieth century of the concept of reflection. He considered it to be a special form of problem solving, thinking to resolve an issue which involved active chaining, a careful ordering of ideas linking each with its predecessors. Within the process, consideration is to be given to any form of knowledge or belief involved and the grounds for its support, (Adler, 1991; Calderhead, 1989).

### Instructor Orientation

As author and instructor of the course context described here, I feel it is important to share my perspective on the process of learning to teach. The following description appears in the course syllabus and offers a glimpse of my personal philosophy of teaching and learning.

> Learning to teach is developmental, procedural, dynamic, political, and problematical. Knowledge is viewed not as static and permanent in nature, but emergent, contextual, situated, and socially constructed. Therefore, novice teachers need opportunities to construct their knowledge by interacting with new ideas in school settings with structured coaching and appropriate interventions.

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Learning to teach is not a process of learning discrete techniques separate from the context of schooling. It must also include reflective capacities of observation, critical analysis and decision making around their identities in interactions with students and colleagues with whom you work.

## Method

This study was situated in the secondary education program where teaching majors split much of their time in content-specific methods courses in a particular college and time in Teachers College for field-based coursework. Twelve graduate students enrolled in a methods course which included two field-based experiences. The purpose of the course is to provide curricular and instructional theory and practice in secondary schools and in the experiences of older adolescent learners in the United States. The students represented a variety of subject-area subjects and had no prior field-based experiences. Students had little or no experience in web authoring, publishing or electronic communication.

Students were asked to reflect on each of the ten standards guiding our university's teacher education program three different times during the semester. I asked them to reflect on and write about their current understandings of the teaching standard and to include an artifact that they felt demonstrated their competency in that particular standard.

I had hoped that students would reflect openly and honestly while incorporating hypertext and hypermedia in the process. An additional requirement was a portfolio presentation where each student would discuss portions of their portfolio with an audience of peers serving as critical friends.

This study uses three major data sources. First, each student's electronic portfolio was analyzed in relation to the research question. A second source of data was the required public presentation of the student's portfolio. The presentation was videotaped. The third source of data was informal discussions and other course generated materials. Some of these artifacts include course papers, e-mail, and journal entries.

Data were collected and analyzed according to qualitative research guidelines for grounded theory research and constant comparative analysis (Glaser & Strauss,), emphasizing, particularly their incremental approach to data gathering and analysis. A key to this approach is the idea of theoretical sampling, described as "the process of data collection whereby the analyst jointly collects, codes, and analyzes the data and decides what data to collect next and where to find them, in order to develop the theory as it emerges (p. 45). Analysis and data collection occur in a pulsating fashion – data collection, followed by analysis and theory development, more data collection, and then more analysis until research is (artificially) completed. Inductive analysis is shaped from the data rather than from preconceived theoretical frameworks. The development of themes resulted from constructive analysis, a process of abstraction whereby units of analysis are derived from the "stream of behavior." (Lincoln & Guba, 1985).

## Preliminary Findings

In this section, I synthesize some of the findings from the analysis and experience for promoting reflection in electronic portfolio environments into two areas for further discussion.

### 1. Reflection is not necessarily in the written work.

The quality and depth of reflection which occurred in the oral portfolio presentation was far greater than the students' written text. The ability to reflect orally in presentation format and in interactions with myself and peers holds great promise for capturing rich reflection. If portfolio requirements ask for only the written reflection and do not provide the opportunity for students to talk reflectively, we change the learning process dramatically.

### 2. Reflection as two-dimensional

The majority of the written reflections were superficial and shallow. It was clear that the students did not want or feel comfortable reflecting on highly personal or ambiguous issues in a web-based format. One student shared that the *gloss* of a web page forced her to write in a way that appeared as "finished" and "clean". In addition, the reflections are mainly text-based as students made limited use of hypertextual language and almost no use of other digital media. Students reported a lack of experience across their curriculum with writing in electronic hypertextual environments.

## Significance

Increasing numbers of universities moving to electronic and digital portfolios will require university educators to provide assistance in the process of deep reflection in this new medium of communication. The potential danger lies in the representation of knowledge as superficial and glossy at a time when the concept of knowledge as constructed and dynamic in nature persists. In an attempt to infuse technologies into the teaching and learning process for preservice students, we may inadvertently move our students "backwards" in terms of knowledge growth. It may be necessary to revisit the literature on portfolios in order to "remember" their original purpose as an alternative assessment method capable of capturing long term process and alternative representations of knowledge.

Data from this study suggests that researchers in this area may need to explore new methods of collecting reflection as it appears in new hypertextual and hypermedia forms. The way in which we ask preservice students to verbalize abstract, complex, possibly ethereal, and certainly fragile understandings of the learning to teach process affects *what* they tell us. If language creates a particular view of reality and of the self as well as serving as a repository of human interests, we need to investigate how language and meaning are mediated by digital environments.

Van Manen (1990) raises the issue of the epistemology of language and text when he states:

> We must not forget that human actions and experiences are precisely that: actions and experiences. To reduce the whole word to text and to treat all experience textually is to be forgetful of the metaphoric origin of one's methodology (p. 39).

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# Weber State University Teacher Education portfolio guidelines: An adaptable model

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The Teacher Education Program at Weber State University is a typical teacher education program in that we teach classes to prepare our prospective candidates for licensure. We require our students to assemble a working portfolio during their student experience that reflects our "strands" of our curriculum. We then require them to create a presentation portfolio for their senior synthesis class. However, we are a non-traditional program because we are assembling guidelines for production of a portfolio that our students can continue to develop when they leave our program. The portfolio will also help them meet a variety of national standards such as the Interstate New Teacher Assessment and Support Consortium (INTASC), National Board for Professional Teaching Standards (NBPTS), and the basic International Society for Technology Education (ISTE) technology requirements.

Our program is based on a model of teachers who reflect, engage, and collaborate (TREC). Underlying this model we have developed a core of classes that include five strands woven throughout the curriculum from the earliest classes to the end of our program. Those strands are: classroom management, exceptionalities, multicultural education, developmentally appropriate practices, and technology. Each strand is addressed within each level of courses offered but may not necessarily be emphasized equally. The strands provide a cohesive blend of content upon which to create a balanced curriculum for our elementary and secondary education students.

However, as our program moves toward our NCATE 2000 review in 2005, we have become increasingly aware of a need for a systematic method for creation of portfolios by our students. We believe that portfolio creation most accurately reflects the changes in the NCATE 2000 accreditation process requiring us to produce evidence of student dispositions.

After surveying our existing guidelines for portfolio production, we found them to be overly simple: create a working portfolio and then create a presentation portfolio before you exit the program. In the past, it has been the individual responsibility of each faculty member to require students to add artifacts to their working portfolios as they progress through our class levels. If faculty have not required this action by the students, then many times no artifacts are added from those courses. What we also found at the senior synthesis level is that our students did not have adequate working portfolios and were using their student teaching experience as the primary source of artifacts for their professional portfolio. This was clearly unacceptable.

After reviewing our TREC model and strands as well as a variety of standards, we began to develop an adaptable model around the ten basic INTASC standards for teacher education program graduates. We felt these standards were reflective of the changes in how licensure is being granted in our state. We also reviewed the ISTE basic technology standards and the broad core concepts for NBPTS and found that may of these standards overlap and would therefore be relatively easy for our students to meet on multiple levels.

We are in the process of developing an adaptable model that meets many of these standards. Our presentation consists of a discussion of the basic INTASC matrix and how those standards overlap into the other standards and how to integrate multiple standards within one working portfolio. Although all standards may not equally apply to all students, we believe that many of our students will benefit from an understanding of how these standards and core concepts overlap as they move forward in their professional development. Further information on this process may be obtained by contacting Dr. Vicki Napper at Weber State University in Ogden, Utah (vnapper@weber.edu).

# A Field-Based Initiative for Integrating Technology in the Content Areas: Using a Team Approach to Preparing Preservice Teachers Use Technology

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**Abstract**: Project ImPACT is a technology integration initiative at The University of Tennessee's College of Education that provides opportunities for preservice teachers to learn to teach with modern technologies. This paper describes a component of Project ImPACT for implementing a field-based team approach to technology integration. Collaboration and teaming is a key component of this model. One major initiative in this project involves the creation of teams consisting of university faculty, clinical faculty and preservice teachers to explore and develop best practices in the use of technology. We will describe our method for providing content-related teacher training and support in the use of instructional technology.

## Introduction

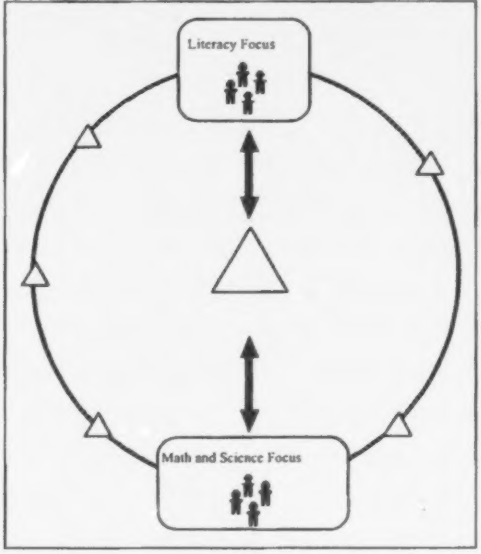
Typical models of technology preparation in teacher education programs focus on providing preservice teachers with necessary skills through a separate computer course as part of the teacher education licensure requirements. While preservice teachers are gaining important skills and concepts, they may seldom see meaningful uses of technology modeled in their methods classes or field placements. To be effective, technology integration needs to occur at multiple points in a teacher preparation program. The team model is an approach that *simultaneously* involves all of the major stakeholders in a teacher preparation experience in training activities, support sessions, and team meetings. We have found that collaborative efforts often create support structures among teams, allowing them to experiment with new skills and share ideas for further adaptation.

## The Learning Team Model

Development teams at partner school sites consisted of preservice teachers, K-7 faculty, and university faculty. Five school sites (three elementary schools and two middle schools) participated in the first year of the project. Preservice teachers placed at these sites were completing their fifth-year internships, and each school maintained close contact with a faculty liaison who was responsible for the group of interns at each site.

Teaming created a dynamic alliance in which each team member played a role in creating the foundation for technology infusion. In order to identify content areas for inclusion under Project ImPACT, we looked at national trends and local contexts. Based on local needs, administrators and teachers targeted specific areas for improvement. As a result, Project ImPACT participants chose to explore the potential benefits of technology to support literacy (reading and writing), mathematics, science, and special education. Out of the five sites, four schools chose to focus on using technology to support literacy, and one school (a middle school), chose to explore technology applications in math and science. While the grant initially included Special Education as a third strand, it was decided that special education adaptations ought to be integrated within the existing strands rather than treated as a stand-alone area for the purpose of this grant. Figure 1 illustrates the modified teaming model.

Figure 1: School-Based Team Model



As content areas were identified, team training was organized into 15-hour Learning Strands and aligned with state and national technology standards and the curriculum needs of each school. Each technology Learning Strand focused on strategies and ideas for using technology to support the curriculum. These five 3-hour sessions were scheduled over a five-week period with ongoing weekly support sessions provided by project staff. Once key topics were identified, project staff created a Facilitator's Manual that provided an outline of critical topics, descriptions of curricular applications at various grade levels, and special education adaptations for each topic being discussed. Learning Strand facilitators were assigned to each site and a follow-up support night session for each week was scheduled and staffed by Instructional Technology graduate students. The follow-up support nights were optional sessions that teams could attend if they needed additional help, or if they simply needed open lab time to work on projects.

## Lessons Learned

Looking back on the progress we have made thus far, it is clear that the teaming model is having a positive impact on preparing all participants to use technology to support teaching and learning. Multiple sources of evidence are being collected throughout the different phases of the grant and will be discussed in future publications. For the purpose of this paper, we would like to reflect on what we have learned from implementing the teaming model at participating school sites.

**Learning Strand Facilitators.** Four facilitators were hired to conduct the 15-hour sessions (due to proximity, two school sites were combined). In addition to technical expertise, each facilitator had K-12 teaching experiences. This combination proved to be very beneficial for both troubleshooting when technical difficulties arose, and for helping participants brainstorm relevant curriculum applications. Because facilitators were well versed in educational applications of various technologies, they were able to tailor instruction to better meet the needs of individual sites. As a result, although each facilitator was given a "training manual" with suggested topics and activities, each one felt comfortable with polling their group, getting feedback, and using this feedback to plan upcoming sessions. While there was overlap in technology applications, each of the sites ended up implementing training in different ways. Their teaching experiences allowed them to shift the focus of the weekly sessions from skills acquisition to one that included a focus on curricular applications.

**Processing Time**. Participants were involved in very intense Learning Strand sessions. While the three-hour extended block of time was needed to focus on a tool in more depth, the weekly sessions made it difficult for participants to process new information. In the future, Learning Strand sessions should be spread further apart, with ample time built in for participants to engage in applying their new knowledge. Although participants' schedules were very hectic, mini-assignments for them to complete and share at the next meeting would allow them to practice what they were learning.

**Support Nights**. Participants' usage of "support night" opportunities was sporadic. Some sites took advantage of these sessions to drop in and work on individual projects, while attendance at other sites remained low. Alternate support mechanisms developed as the project matured, and ranged from simple emails for help, to setting up individual times for project staff to go out to a school to help troubleshoot. At this point, we are asking each team to meet and decide on a support plan that best meets their needs and their schedules. By placing responsibility with the teams, support structures will be customized to each site.

**Web Site Resource**. As part of the project, we provided participants with access to a web site that included supplementary materials and resources links. We found that this area was accessed infrequently, even though it contained printable handouts, training guides, and links that were organized by content areas. To increase participants' awareness of the site's resources, a facilitator at one of the sites began introducing a "Site of the Week" at the beginning of each meeting, and allowed participants time to explore the selected links. After introducing this activity, survey responses indicated that access increased. If we want teachers to take advantage of a web-based resource, we have to continue to find ways to advertise its content and make direct connections for teachers. One way we plan to do this will be to upload a searchable database of sample projects and lesson plans created by each of the project participants. We provided each team with a standard lesson plan template for consistency and we will be collecting sample projects that are tied into our state curriculum standards as well as the national technology standards.

## Conclusion

The field component of this project directly supports project team efforts to develop creative teaching strategies connecting technology across the curriculum. During field placements, clinical faculty, university faculty, and preservice teachers worked together to explore technology possibilities and to develop, share, and/or implement technology-rich lessons. We believe that this approach will help preservice teachers develop an in-depth understanding of how technology can be used as a tool in teaching and learning. This project has reinforced our belief in the need to restructure coursework and experiences to include uses of technology that are developmentally appropriate, integrated across subject areas, and that actively engage learners.

# Online Learning, Online Mentors, and Preservice Technology Education: A Study

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**Abstract: What happens when secondary education teacher candidates are afforded the opportunity to learn about the role of telecommunications to support teaching and learning using online learning modules coupled with online mentoring? For this pilot study designed to assess the feasibility of combining online learning and online mentoring, five online learning modules were designed. Each module included readings and interpretive activities, tool-based tutorials, and the design of lesson plans. Teacher candidates were paired with online mentors who were veteran teachers in the candidate's content specialization. Each online activity resulted in a product emailed to the online mentor. Online mentors responded to products, asked follow up questions, and discussed technology-using practices. This paper presents results related to the central question: What is the impact of online instructional modules coupled with online mentoring? Particular attention is given to the teacher candidate/online mentor interaction and shifts in teacher candidates' stages of concern.**

Some preservice teacher preparation programs require separate courses that examine the role of technology to support learning, while others attempt to integrate considerations about technology and learning throughout preservice programs. Neither solution has been completely satisfactory with a number of concerns continuing to plague preservice technology education. One, opportunities for observing best practices in schools are limited as practicing teachers wrestle with using technology themselves or have limited access (Norton & Sprague, 1999). Two, faculty whose expertise centers on foundations or disciplinary teaching methods or learning and development also wrestle with the role of technology to support learning. They find it challenging to use technology to support their own teaching or to teach about technology to support the learning of K-12 students. Three, too often, teaching preservice teachers becomes the responsibility of instructional technology faculty, all too often resulting in technology education being divorced from the ongoing flow of preservice education.

Few today would challenge the increasing use of technology education's place in the preparation program of future teachers. Thus, professional development programs and courses are being developed and offered in a variety of ways, utilizing technology to differing degrees. Some simply use technology to improve presentations, while others use technology to offer courses entirely online. The U.S. Department of Education's National Center for Educational Statistics (NCES) reported that distance education programs increased by 72 percent from 1994-95 to 1997-98 (*Quality On the Line: Benchmarks for Success in Internet-Based Distance Education*, 2000). More and more professional development opportunities for K-12 teachers are becoming available online. While there is a great deal of research in the large category of distance education, the field of online learning is still developing its literature base (Dabbagh, 2001). Within that field of research, there are few studies that have specifically looked at online learning for K-12 preservice teachers.

Preservice teacher candidates are generally adult learners accustomed to being responsible for most aspects of their lives. Much has been written about how to best approach the task of educating adults effectively. Principles of effective adult education include the idea that adult education can and should be viewed as a collaborative activity. Mentoring relationships are an ideal way to facilitate collaboration. Although mentoring in general has a broad literature base, online mentoring is a relatively new area of research (Rogan, 1997). The few studies that have been conducted have concluded that online mentoring is an effective instructional approach, mutually beneficial to learners and mentors (Rogan, 1997; Riel & Fulton, 2001). Communication technology such as email provides an excellent way for collaborative learning to take place as novice, preservice teachers enter the community of teachers. Norton and Sprague (1997) reported that online collaboration in lesson planning has a significant and powerful impact on preservice teachers. They concluded that "collaborating with practicing teachers enthusiastic about educational technology . . . has the potential to break the cycle of replicating one's own educational experience in one's practice (p. 160)."

Given the potential of online learning and mentoring and in response to a request from the Secondary Education Program, a pilot online learning module was designed to assist eight preservice teachers to learn about the use of telecommunications to support teaching and learning for middle/high school students. In order to assess the effectiveness of this instructional strategy, the following central question was posed: What is the impact of online instructional modules coupled with online mentoring on preservice candidates' attitudes and understanding about using technology to support teaching and learning? To answer this question, three research questions were addressed: (1) Were teacher candidates successful in completing the modules? (2) Did teacher candidates report changes in their sense of technology competence, their ideas about teaching with technology, and the role of collegial relations in the process of becoming technology-using teachers? and (3) After completing the instructional modules, did teacher candidates' stages of concern related to technology as an educational innovation change?

## Methodology

Subjects of this study were eight teacher candidates enrolled in the secondary education program at George Mason University. All eight subjects were pursuing a second career and currently employed in other jobs. One person was employed as a teacher on a provisional license. The subjects were enrolled in a 4-credit educational psychology course for which one credit requirement was met by completing the online modules. All were simultaneously participating in observations of classroom teaching in their content areas. Candidates ranged in age from 25 to 38. Seven were female, and one was male. The content areas represented were biology (1), English/language arts (3), and social studies/history (4).

Preservice candidates completed five online instructional modules, coupled with online mentoring. The modules consisted of a variety of activities designed to help preservice candidates understand how telecommunications can be effectively used for teaching and learning. For example, in one activity, candidates were guided through the creation of a WebQuest appropriate for their content area. All assignments and instructional material were available to the teacher candidates as web pages with the exception of one reading assignment provided in print. Completed assignments were emailed to the assigned online mentor - a practicing teacher in the candidate's content area. Online discussions about the assignments resulted in candidates having a better understanding of how the product could be used for teaching and learning, and sometimes revisions were made based on these discussions. Candidates were given ten weeks to complete the five online modules. At the end of that time, online mentors rated the candidates' performance.

Researcher-constructed surveys were administered before and after candidates completed the online modules. One of the researchers attended the face-to-face class meeting to distribute and collect the surveys at the beginning of week one and the end of week ten. Surveys included questions about basic demographic information; ratings of their sense of technology competency, the importance of collegiality in using technology for teaching and learning, and their desire and ability to use technology for teaching and learning; and ratings of their performance and interactions with online mentors (collected in the post-survey only). Additionally, the researchers used the Stages of Concern Questionnaire (Hall & George, 1979) to collect data about the changes in candidates' stages of concern about technology as an educational innovation.

## Results

The first research question asked: Were teacher candidates successful in completing the modules? In order to answer this question, mentors' responses to the teacher candidate rating form were tallied using 4 for excellent, 3 for good, 2 for moderate, and 1 for poor. These values were used to compute means for each item on the rating form. Results of the analysis are presented in Table 1. As Table 1 shows, online mentors rated teacher candidates' performance as falling in the good to excellent range on all rating items. Clearly, online mentors believed that teacher candidates performed well in the course, mastering concepts and assignments. In addition to the mentors' ratings, students were asked to rate their performance on the varied activities included in the online instructional modules. Summing all teacher candidate ratings and computing a mean resulted in a rating of 72.5 that corresponded with a "fairly satisfied" rating. It is important to note that one teacher candidate's self-rating was very low (in the "not satisfied" range). This teacher candidate's online mentor also rated this candidate's performance low. The low rating by both the teacher candidate and the online mentor skewed the means.

| Rating Items | Mean Rating |
|---|---|
| Level of Technological Success | 3.75 |
| Understanding of Telecommunications | 3.75 |
| Quality of Products/Assignments | 3.63 |
| Quality of Interactions with Mentor | 3.44 |

**Table 1. Means for Mentor Ratings of Teacher Candidates' Performance**

The second research question asked: Did teacher candidates report changes in their sense of technology competence, their ideas about teaching with technology, and the role of collegial relations in the process of becoming technology-using teachers? In order to answer this question, teacher candidates' responses to pre- and post-surveys were collected, and means were computed for each item. Results are presented in Table 2. Means presented in Table 2 for technology competency reflect a rating scale of 1 for poor/rarely used, 2 for moderate, 3 for good, and 4 for excellent. Means for the usefulness of working with technology-using colleagues reflect a rating scale of 1 for not useful, 2 for somewhat useful, 3 for important, and 4 for very important. The final two items' means in Table 2 reflect a rating scale of 1 for rarely/never, 2 for sometimes, 3 for often, and 4 for very often. Examination of the means in Table 2 reveal a shift from good toward excellent in candidates' sense of technology competency, little or no change in their sense of collegiality or their desire to use technology to support teaching, and a decline in their sense of their ability to use technology to support teaching and learning.

| | Pre-Course Mean Rating | Post-Course Mean Rating |
|---|---|---|
| Technology competency | 3.0 | 3.56 |
| Usefulness of working with technology-using colleagues | 3.38 | 3.19 |
| Desire to use technology in teaching | 3.19 | 3.06 |
| Ability to use technology in teaching | 3.13 | 2.88 |

**Table 2. Means for Teacher Candidates' Ratings Concerning Technology and Teaching**

The third research question asked: After completing the instructional modules, did teacher candidates' stages of concern about technology as an educational innovation change? In order to answer this question, teacher candidates' responses to the thirty-five items on the pre and post Stages of Concern Questionnaire (SoCQ) were grouped by relevant stage, totaled and converted to percentile scores using guidelines in the SoCQ manual. Percentile scores for each stage were averaged for the group and graphed. Results for the group are presented in Table 3 and Figure 1.

|  | Pre-Survey | Post-Survey |
|---|---|---|
| Stage 0: Awareness | 58.63 | 49.38 |
| Stage 1: Informational | 74.00 | 69.25 |
| Stage 2: Personal | 79.50 | 78.63 |
| Stage 3: Management | 56.88 | 58.62 |
| Stage 4: Consequence | 57.25 | 44.75 |
| Stage 5: Collaboration | 52.50 | 66.00 |
| Stage 6: Refocusing | 62.62 | 71.25 |

**Table 3. Mean Percentile Score for Teacher Candidate's Stages of Concern**

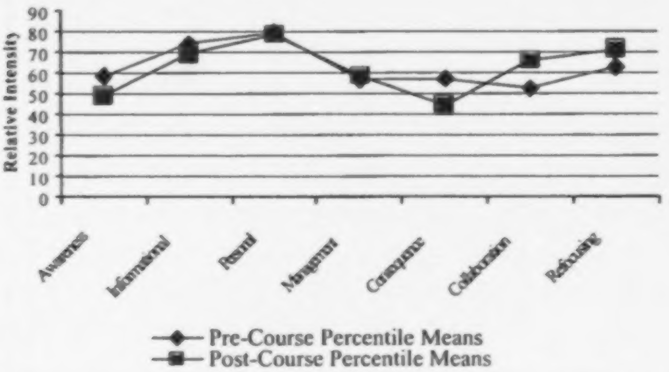

**Figure 1. Mean Percentile Score for Teacher Candidate's Stages of Concern**

Since this was a pilot study lasting only 10 weeks, it is not possible to draw definitive or statistical conclusions. Nevertheless, it is possible to identify some preliminary trends. Prior to beginning the online modules, the highest concerns expressed by participants were personal concerns followed by information needs. In addition, expressed concerns about consequences for students, collaboration with peers, and refocusing were lower. This profile illustrates normal, interested nonusers who are somewhat aware of and concerned about the role of classroom computers integrated with teaching and learning. This would be an expected profile. Post survey scores indicate a trend toward fewer concerns in awareness, information, and consequences for students (although these remain as the highest reported concerns) as well as demonstrating trends toward increasing concerns relevant to collaborating with others and refocusing. This remains an expected profile for normal, interested nonusers with subtle shifts toward the profile of the beginning user.

In addition to the survey results, preservice candidates were provided the opportunity to share their impressions with the researchers after completing the post surveys. Two categories of feedback emerged. First, preservice candidates expressed deep appreciation for the work of the mentors. All eight candidates felt their interactions with their mentor led to insights into the ways in which the concepts and activities embedded in the online modules might bridge to classroom practice. They felt that the insights and support of the mentors helped them transition their beginning ideas and impressions into ideas for practice. Second, preservice candidates felt that associating the online modules with a foundation course was premature and that the modules would have been more meaningful had they been associated with methods classes. Candidates' knowledge about curricular and instructional issues as well as their inexperience with lesson planning in general handicapped their ability to create robust connections with practice.

## Discussion

Once again, it is important to note that this was a pilot study, limited to five learning modules completed during a ten-week period. Nevertheless, trends suggest some insights for technology education. (1)

Preservice candidates were able to successfully learn when online modules and expert mentoring were combined. Mentors rated candidates' success, understanding, quality of products and interactions with mentor in the good to excellent range, students reported being "fairly satisfied" with their performance, and positively impacted candidates' awareness and informational concerns; (2) Participating in the online modules and mentoring activities improved candidates' sense of technology competency but had little impact on their desire to use technology in their teaching; (3) Participating in the online modules and mentoring activities decreased candidates' confidence in their ability to use technology in their teaching, suggesting that candidates' began to understand the complexities of teaching with technology and that technology's role in education is more than teaching mastery of software applications; (4) Partic ipating in the online modules and mentoring activities had a positive impact on candidates' sense of the importance of the role of collaborating with colleagues to improve their practice; (5) Linking preservice candidates with expert mentors who can serve as models of technology-using practice is a powerful strategy for assisting candidates' entrance to practice and the process of becoming technology-using educators. This strategy, linking preservice candidates with expert teacher mentors, appears to offer opportunities for collaborative support systems whose power for promoting technology-using practice may well exceed course work or field experience opportunities; and (6) It is important to recognize the role of the modules in structuring and centering the candidate/mentor relationship. Giving structure and guidance to the mentoring relationship appears to have central importance. Casual or unstructured conversations, while useful, are less productive than conversations that are guided by a clear framework and specific contents put forward by the online modules. This not only supports candidates in structuring informed questions and interactions but also assists the mentor's ability to articulate and share expertise.

Perhaps the most important lesson emerging from this pilot study is what appears, at first, to be the major criticism provided by candidates. Candidates' expressed concerns with linking these modules with a foundations course as opposed to a methods courses and their decreased sense of their ability and confidence to use technology to support teaching and learning suggest that it is possible to design learning experiences for preservice candidates that clearly articulate technology's power to support teaching and learning. Additionally, this instructional design seemed to communicate to candidates that what matters for educational practice is not technology competence but competence with broader issues of curriculum and instruction. If activities focus on teaching and learning with technology and are linked with assistance and support of an expert technology-using mentor, trends identified in this study point to the power of online learning coupled with mentoring to assist preservice candidates' to understand the power of technology for student learning. Clearly, this is an avenue for further research.

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# A Classroom Discipline Problem Solving Environment for Preservice Teachers

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**Abstract:** Most Preservice teachers don't have much experience dealing with classroom management problems such as student misbehavior. Though they learn classroom management principles, they don't even know how those principles are related to multiple learning perspectives. Therefore, as a learning support tool, for preservice teachers at universities, a classroom management course web site was developed. A basic assumption of the site is that preservice teachers can more effectively solve classroom management problems if they are exposed to multiple learning perspectives and engage in real world problem solving activities. The classroom management course web site has problem context, problem representation, and problem manipulation space for preservice teachers to engage in authentic classroom management problems. Also, multiple perspectives on problem solving process are presented in two different points of view-learning theorists and field experts.

## Introduction

Lots of different approaches have been used to solve classroom management problems (Levin & Nolan, 2000). Those approaches assume that the use of certain classroom management techniques can be successful enough to resolve classroom discipline problems if it were well applied. However, some researchers suspect the effectiveness of the classroom management techniques. Research on the effects of teacher education has been done to examine how those techniques affect teacher's classroom management performance. Evertson's (1989) study showed that one teacher education program has been successful in decreasing classroom discipline problems. The teachers who had been trained demonstrated greater use of classroom management skills, and their students made less misbehavior. However, though teacher education programs include learning activities in the area of developing course materials, planning classroom activities, and developing classroom rules and procedures, those do not provide real life classroom discipline problems so that learners may manipulate and simulate the problems. Thus, multiple approaches need to be connected to authentic real world problem situation and several different perspectives in educational field.

The purpose of this study is to examine how preservice teachers solve classroom discipline problems. To explore the answer, two questions were addressed: "Who do preservice teachers confer with when they need to solve classroom management problems?" and "What are the effects of scaffolding when preservice teachers solve classroom disciplines?"

## Design Issues

The Classroom Management Web site has four features of problem solving process-problem representation, problem manipulation, problem justification, and problem reflection. To guide students' cognitive development, questioning strategies were selected. Ge (2001) argued that formulating and answering questions enabled students to identify the main ideas and the ways the ideas related to each other and to the students' prior knowledge and experiences. Jonassen (1999) argued that an effective method for representing problem is "narrative." Gick (1986) claimed that learners extract the given information and attempt to understand the problem or try to connect it to their existing knowledge base so that an integrated representation can be build. Problem manipulation space enables learners to manipulate, simulate and experiment their problems. By seeing the results of their experiments, they can test their own hypotheses about the problems (Jonassen, 1997). Learners should develop arguments to support their decisions. Learners can be asked to reflect on what they have done, what assumptions they made, and what strategies they used (Jonassen, 1999). By reminding them of their initial conditions of the problem and helping them to reflect on their solutions, reflective prompts can help students to integrate knowledge and serve to guide the inquiry process.

## Method

This study examined three participants' problem solving process. A pilot test was conducted to test web site for classroom discipline problems which had been developed for preservice teachers. Preservice teachers' decision making processes were examined by analyzing their log files. In addition, preservice teachers were asked to solve various case problems. They could get access to multiple problem solving advice. All problem solving processes were recorded and analyzed using qualitative description

During the test, the participants were asked to solve a classroom discipline problem. While doing the task, they answered to three question prompts: What do you think the problem is?, What would you do in this situation?, and Why would you choose this course of action? Besides, the "think aloud" technique was used to capture what the participants were thinking while working with the task. In order to examine the participants' problem solving processes, whole problem solving processes were videotaped. This videotaping provided a record of the process while the testing was being conducted.

## Results and Conclusions

The findings from this study point to two conclusions. First, authentic learning environment which is supported by multiple perspectives from "Field experts" and "Learning theorists" will naturally invoke students' higher order thinking. While participants used the classroom discipline web site, they tended to get advice as much as they could. Rather than responding to three question prompts, they conferred with several on line experts before making decisions. It showed that participants wanted to confer with the persons who have lots of real world experience in school. Second, question prompts can be an important strategy for helping students' problem solving process. Question prompts guided preservice teachers' learning activities. However, despite three different question prompts which encouraged students to engage in a real problem solving processes, they were not effective enough to enhance students' problem solving skills. It was supported by the results of students' inconsistency in their solutions. Therefore, the finding suggests that scaffolding strategies used in online learning environments should be dynamic, adaptive, and immediate to students' learning activities.

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# Integrating Technology to Enhance Performance Assessment

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The International Society for Technology in Education (ISTE) has recently developed standards related to the integration of technology into teacher education programs. These standards state that teacher candidates should demonstrate a sound understanding of technology operations and concepts as well as the ability to plan and design effective learning environments and experiences supported by technology (ISTE, 2000). Additionally, the new National Council for Accreditation of Teacher Education (NCATE) 2000 Standards call for standards-based performance assessment of teacher education candidates that verifies their knowledge of the content of their fields. These assessments must give candidates an opportunity to demonstrate professional and pedagogical knowledge, skills, and dispositions. According to Eisner (1999) performance assessment is a practice "that requires students to create evidence through performance that will enable assessors to make valid judgements about 'what they know and can do' in situations that matter" (p. 2).

As teacher educators at a large, urban university in the Southwest, we were faced with the daunting task of incorporating ISTE and NCATE standards into our practice. We chose to focus our energies on revising an undergraduate course. The course, Strategies for Effective Elementary Classroom Teaching, is an introduction to instructional techniques and management strategies for the elementary classroom. To fulfill our obligation to meet national standards, we sought to revise the course simultaneously in two ways: 1) to integrate technology into our teaching and our students' teaching and learning, and, 2) to develop performance assessments that provide teacher candidates opportunities to demonstrate their knowledge, skills and dispositions in realistic settings. Field experiences for teacher candidates are regarded as central to the development of knowledge and skill (NCATE 2000) and we believed that partnering with a professional development school would allow candidates to develop and utilize their knowledge of both effective teaching strategies and technology skills. Because hands-on, student centered approaches to learning are an essential condition for creating learning environments conducive to effectively using technology for teaching and learning (ISTE, 2000), we developed performance assessment tasks that involved student and/or instructor use of technology. These performance assessments, we hoped, would allow us to accomplish our goals for authentic candidate learning tasks and the integration of technology.

We embarked on a program of research in order to evaluate and document the integration of technology, supported by our institution's PT3 grant. Additionally, we were supported by our College of Education with permission to team teach this course. It must be noted that both instructors are elementary education generalists, and that neither researcher was proficient in the technologies we hoped to integrate. However, according to Carlson and Gooden (1999) it is critical for teacher educators to model technology use in order to prepare teacher candidates to integrate technology into their instruction. In a previous paper (Olafson & Quinn, 2001), we report complete findings from this qualitative study, including the impact of technology integration on the learning environment. In this paper, however, we focus on describing three performance tasks (and the ways we assessed these tasks) in which we integrated technology.

## Data Sources/Methods

Participants included 65 pre-service teachers in three sections of the Strategies for Effective Elementary Classroom Teaching course. At the beginning of each term, after reading the Consent to Participate form, students were given the option of transferring to another section of the course. Over all semesters, four students chose to withdraw from our sections.

We approached the study through participant -observation; that is, classroom observations, in-depth interviewing, and document collection were conducted. Data collection was extensive and ongoing throughout the semester. On the first day of class, students were asked to complete a technology survey so we could gauge their current understanding and use of technology. Students completed this survey again at the end of the semester. They also completed The Epistemic Beliefs Inventory (Schraw, Bendixen & Dunkle, in press) so that we could gain an understanding of their beliefs about learning. Additionally, a graduate assistant took detailed field notes during each class session. We collected artifacts produced by the pre-service teachers (e.g. statement of philosophy, in-class assignments, responses to reading) and their technology products (the Video Case Project and their Team Teaching Project). We videotaped their presentations of the technology products. At mid-term and at the end of the term students completed written reflections that were intended to evaluate the course. And, finally, at the end of the term, one-on-one interviews were conducted.

We considered all the forms of data that we collected as texts to be interpreted. Our approach to uncovering or isolating themes from the data was the selective reading approach advocated by van Manen (1990). After reading and viewing the texts several times, we asked ourselves what statement(s) or phrase(s) seem particularly essential or revealing about the phenomenon being described? These statements were then highlighted and used for further analysis (Bogdan & Biklen, 1998; van Manen, 1990).

### Context/Performance Tasks

Our pre-service teachers were organized into teaching teams and assigned to a classroom and a teacher at a Professional Development School. Teams were expected to become familiar with the teacher, the students and the curriculum currently being taught in the classroom to which they were assigned. These teams were given three performance tasks requiring them to demonstrate their knowledge, skills, and dispositions toward the use of technology in developing an understanding of effective teaching. Each performance task was designed explicitly to foster a connection between authentic elementary classrooms and our university classroom In addition to participation in classrooms, real time viewing of a variety of classrooms provided candidates with depictions of typical complexity and spontaneity (Edens, 2001).

### Performance Task One: Video Case

Each team worked together using digital cameras to photograph teaching in elementary classrooms. Teams scheduled a time when they photographed a lesson taught by their assigned teacher. In order to demonstrate their understanding of dimensions of effective teaching, teaching teams selected images from their collection of photographs and created PowerPoint presentations showing evidence of students being grouped for instruction.

In the second and third semesters of the current project, we revised the video case project to a "Storyboard" assignment. Candidates again used digital cameras to photograph a lesson taught by their assigned teacher. Instead of capturing images of grouping for instruction, in this assignment candidates selected photographs that showed the beginning, middle and ending of a lesson. Using PowerPoint, candidates constructed storyboards by importing these photographs and including a written description of the progression of events. Descriptions included the following components: lesson context and content, purpose, motivation, teaching and student behaviors, assessment, student outcomes, and reflections.

Candidates were assessed using a point system that included an evaluation of the content of their storyboard (the written descriptions for each picture) and an evaluation of their presentation design. We believed that technology should enhance content knowledge and that presentations needed to reflect the integration of technical skills and content knowledge. Therefore, assessment criteria for presentation design included graphical design, screen design layout, logical sequencing of information, selection of pictures that conveyed meaning, and clear and appropriate subject knowledge.

### Performance Task Two: I-Movie

For their second project, teaching teams scheduled times for the team to teach and videotape two lessons, one with a direct instruction approach, and one with an indirect instruction approach. In the third semester we revised this assignment because we found that candidates had more difficulty with adopting an indirect approach. We decided that it would be more helpful to students if we devoted additional time for planning and implementing lessons that were student focused rather than teacher directed. In all three semesters, teams were expected to create multimedia presentations of the teaching experience using I-Movie. The final presentations included their lesson plans, edited video clips of their videotaped teaching, and a commentary and reflection on practice.

Candidates were assessed using a scoring rubric that focused on two main dimensions of their technology products: the lesson and their technical skills. Using three levels of performance (not evident, evident at an acceptable level, evident at an exemplary level) candidates were expected to demonstrate in their presentation that objectives had been met for planning an instructional event, implementing instruction, developing relationships with students, gathering evidence of student learning, and reflecting on the lesson taught. For the second dimension assessed, technical skills, candidates needed to demonstrate competent use of imaging devices and editing software, and presentation software skills. For example, both design principles and presentation content were assessed: assessment criteria included appropriate amounts of video, stills, and audio enhancements, and clear and correct subject knowledge evident throughout the production.

### Performance Task Three: Post-RAVO Reflections

RAVO is a Remote Audio/Video Observation system designed for recorded and real time observation of elementary classrooms in a professional development school. Observations between the university classroom and the elementary classrooms are made possible through two cameras (located in the ceiling) and four wide-range microphones in each of 12 elementary classrooms. The cameras and microphones can be remotely controlled from the university classroom. A full screen (7' by 7') in the university classroom makes it possible for teacher candidates to view student and teacher behavior. Broadcast-quality images can be enhanced through a zoom feature that provides minute details of student interactions and work. For example, it is possible to read individual student's journal entries from the university classroom. Throughout the semester, teams completed three written reflections regarding their observations of particular teaching strategies. Structured observations were completed for the following topics: instructional strategies, classroom management, and questioning strategies. For each observation, candidates were provided with focus questions prior to their viewing experience.

Written reflections were assessed on a credit/non-credit basis, based on candidates' abilities to address the focus questions. The focus questions (e.g "What are the modes of instruction that you observed? Cite support from the textbook") were intended to elicit from the candidates connections between the text and lectures and their real-time observations of life in elementary school classrooms. We hoped, as Edens (2001) found, that technology would provide powerful new collaborative learning tools and assist with the transition from campus classroom to a field setting.

## Findings

Designing assessment tasks that incorporated technology resulted in three main findings. First, we found that students became proficient in the use of imaging devices editing software, and presentation software. Based on the results of the technology survey, students perceived that their video production and presentation skills improved dramatically over the course of the semester. One student exclaimed, "The use of technology in this course was amazing. We started with a lesson on paper and finished with an I-movie!"

Secondly, we found that teacher candidates began to see that the integration of technology could be beneficial for students at any level. They were able to articulate how they might begin to use similar technologies in their future classrooms. In the second semester, many of the teaching teams attempted to integrate Inspiration software into their lessons. In other words, candidates demonstrated both an understanding of technology operations and an awareness of designing learning experiences supported by technology. It seems that our candidates met Gillingham and Topper's (1999) definition for technology literacy for new teachers: "having the skill and dispositions to use technology in flexible and adaptive ways for the purposes of classroom instruction and professional development" (p. 305).

Our third finding was that integrating technology enhances pre-service teachers' understandings of effective teaching strategies. We were consistently impressed by their rich discourse about specific strategies and their awareness of the ways in which novice and expert teachers implement strategies. The experience of observing and reflecting on their digitized images and remote observations increased candidate learning of content. The remainder of this section focuses on evidence of candidate learning.

## Performance Task One: Video Case/Storyboard

Both the Video Case project and the Storyboard assignment required multiple viewings of digital images from an actual elementary classroom. Repeatedly watching teacher and student behavior allowed teams to engage in critical reflection, and provided them with opportunities to reflect on classroom experiences in an environment outside the classroom setting yet in a context where the "discourse of teachers" is shaped by the experiential realities of the classroom (Profriedt, 1995, p. 33). In particular, candidates reflected on observed teaching strategies. For example, one student commented on the impact of completing the Video Case project: "I really love the video case project because I feel that I have a physical example of the teaching modes, classroom management techniques, and grouping techniques we have read about and discussed."

In order to complete the Storyboard assignment, candidates needed to be selective in choosing three images that best represented the content and strategies utilized by the teacher. At the same time, candidates demonstrated their understanding of the progression of events when implementing a lesson. One of the teaching teams, for example, titled their three slides in a manner that indicated understanding of the development of a third grade lesson on prepositions:

1. Getting Started: Pulling out the pieces for the preposition Halloween book
2. Busy at Work: On, under, above beside. Where do the monsters belong?
3. The Finished Product: Working together to create the Halloween book

In their written description, these candidates noted that students were motivated to complete the activity because they were constructing a student-made class book that was connected to a Halloween theme. They noticed that teaching strategy is connected to student behavior: "the teacher's modeling and guided questioning led to students' participation in the demonstration and their eager involvement."

## Performance Task Two: I-movie

Candidates' I-movies and their presentations of their products to the class demonstrated growth in knowledge, skills and dispositions in three areas: student learning, content knowledge, and collaboration. In their presentations, candidates recognized the role of prior knowledge and the importance of connecting content to students' lives. The following excerpt from a presentation highlights this growing recognition:

> We structured our lesson to familiarize the second graders with weather terminology. Instead of just standing at the front of the room and going over the vocabulary with them, we decided to bring in an element from their lives outside of school. We constructed a 6 X 4 television set and Mitch dressed as a meteorologist and gave a weather forecast. In the forecast, he used the weather words and explained their meanings. This was a great way to introduce the vocabulary.

Each team was also expected to provide evidence of student learning. That is, teams were expected to demonstrate that their teaching had an impact on K-5 learners. The following examples show that candidates developed an awareness of assessing student learning:

> We found that using centers provided an atmosphere conducive to enrichment, exploration, motivation, and creative discovery. We assessed students' participation in each center and their completion of activities.
>
> We did our lesson on classification and how to use rocks to explore classification. Students sorted rocks by observable qualities. Students were able to organize collected data visually, and we assessed their understanding by observing they way they sorted rocks.

Candidates also demonstrated their ability to connect content knowledge of general teaching strategies to the lived reality of the classroom. One of the teaching teams gave a homework assignment, and explained that "Our text states on page 275 that homework can have many positive contributions to a child's learning when it is thoughtfully planned to extend classroom learning."

And, finally, candidates demonstrated behaviors that are characteristic of developing teachers. Candidates were expected to develop collaborative and collegial relationships with their peers and with experienced classroom teachers. As Phelps (2000) notes, "the need for creating collegial communities is critical" (p. 47). In order to complete their technology products, candidates needed to work collaboratively. For the majority of teaching teams this was a positive experience. "Getting to collaborate with my group" was frequently mentioned in the interviews as one of the benefits of technology integration

### Performance Task Three: Post RAVO Reflections

In this third set of performances, we again found that candidates were able to make connections between their content learning in the textbook and elementary classrooms. In order to successfully complete the post-RAVO reflections, candidates had to recognize teaching strategies as they were occurring in the lived reality of the classroom. The following example shows how a teaching team identified the instructional mode utilized by the teacher during a fifth grade math lesson:

> The math lesson was clear example of expository or direct instruction. On page 228, our text states that transmitting knowledge from those who know it to those who don't know is expository instruction. An example of this is when the teacher provided rules for graphing.

Another teaching team realized the interconnectedness of instructional strategy and classroom management, noting that there were fewer disturbances when students were engaged in learning: "the students were self-directed in the learning centers. We saw that students who are actively involved behave much better and seem to truly enjoy learning."

As teaching teams developed their observational skills, they became more insightful and were able to produce interpretations that were supported by evidence. In the next example, a team identifies types of questions asked by the teacher and provides a summary that shows their observation of a questioning pattern: "We noticed that the teacher worked in a pattern, beginning with comprehension questions, then restating and clarifying, and then asking reflective questions."

Each performance task required candidates to use technology in various ways to demonstrate newly acquired teaching skills. These performances satisfied the dual purpose of learning about teaching strategies and learning about technology. An inherent goal in the tasks was to help candidates understand that technology must enhance student learning. Like Hartley (2001) we believe that new technologies do not have any inherent value. Only through their use do they become valuable.

### Discussion

We agree with Morey, Bezuk, and Chiero (1997) who believe that "Technology can also be a valuable resource for improving teacher education" (p. 21). In particular, the use of technology can ground the program in real-life situations (Kenny, Andrews, Vignola, Schilz, & Covert, 1999). "Unfortunately, the majority of teachers are not trained in their preservice programs to effectively integrate computers and other technologies into their classroom teaching" (Perry & Talley, 2001, p. 26). Our candidates observed and participated in real-life situations that required the use of technology. And furthermore, perhaps this participation was made possible only through the use of technology.

In the realm of technology, the learning curve is steeper for some than for others. Teachers caught in the maelstrom of classroom life may be hard pressed to learn and use current technology in educational settings in order to incorporate them. According to Sprague, Kopfman, and de Levante Dorsey (1998), "Classroom teachers sometimes feel ill-prepared to integrate technology into the curriculum" (p.24). In addition to integrating technology into the curriculum, teachers are expected to be technology instructors in the classroom. ISTE (2000) states that "Our educational system must produce technology-capable kids:"

kids who will be able to use technology in an "increasingly complex and information-rich society"(p. 2). Obviously teachers, as implementers of the education system will be expected to help produce these 'technology capable "kids." By no means is this an easy task.

Given all that is currently known about classroom teachers integrating technology into instruction, the role of technology in pre-service teacher education is critical. In teacher education settings where candidates have the time to experiment, explore and practice technical skills in an environment that is low-risk and focused on pedagogy, the gaps between theory, practice and technology can be narrowed. Because of the support received from our institution's PT3 Grant, we were able to create conditions necessary for the integration of technology in pedagogically appropriate ways. Teacher education candidates developed an understanding of the interplay between teaching and technology, and faculty experienced, first hand, ways technology can facilitate powerful learning. Through completion of performance tasks requiring the use of technology, candidates and faculty recognized the potential of technology for changing assumptions and current educational practices and perspectives.

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# Technology as a Practical Tool for Real World Teaching

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Discussions concerning distance education and web enhanced teaching strategies for colleges and universities continue to be directed towards ways in which technology can be used within a conventional university or public school structure. Optimistic points of view argue that using technology encourages, if not actually requires faculty members to think outside the box. In theory, this call for innovative and more flexible teaching strategies seems promising. Unfortunately nobody seems to agree on how this transformation might be implemented or how to transform theory into practical applications. From the perspective of faculty members, "thinking outside the box" seems nothing more then a plea to find new and innovative ways to accommodate vast technology expenditures by utilizing course delivery systems. In public school environments, thinking outside the box generally means figure it out, or, just do it.

For distance education programs to be successful they must be grounded within the context of actual needs and reachable objectives. Courses need to be structured in ways that will give ownership to the professors or public school teachers who design and teach them. Course development must offer a solution for something other than technology integration for its own sake or for the sake of earning required certification credits. These issues are crucial in the design and delivery of online courses in teacher education programs. In this paper I will offer a model developed by The Technology Outreach Project that we have put into practice at North Carolina A&T State University. In addition to providing technology instruction for pre-service teachers, this model combines pre-service teachers with in-service teachers who are seeking required technology certification credits.

Every spring semester I teach English 460 – Technology and the Teaching of English. This course is designed to instruct English Education majors in the second semester of their junior year in effective and appropriate strategies for using technology to enhance their teaching. These students are given instruction in the use of Blackboard as a tool for developing and enhancing the quality and the delivery of their curriculum materials. After approximately three weeks of technology instruction, pre-service teachers in Engl. 460 are paired with our list of in-service teachers seeking required technology or certification credits. All pre-service and in-service teachers are enrolled on our 460 Blackboard site. The first task for pre-service teachers is to instruct in-service teachers in the use of Blackboard by utilizing the virtual classroom and other available telecommunication resources.

After both groups feel comfortable in the Blackboard environment, in-service teachers are asked to critic, refine, and offer advise after viewing curriculum programs posted on Blackboard by our pre-service teachers. In-service teachers are given a set of guidelines for this activity. Once portions of the curriculum have been identified as appropriately designed for electronic classroom delivery, the in-service teachers provide instruction in the use of Blackboard for students in their classroom who will actually use the curriculum materials developed by pre-service teachers. In addition to Blackboard, we also utilize other software programs such as PowerPoint, and for writing components we utilize Storyspace. This model serves the needs of three audiences: pre-service teachers, in-service teachers, and actual students in the in-service teachers public school classroom.

The benefits of using this model include more then just learning technology skills for pre-service and in-service teachers. We are also increasing the technology skills of actual students in a public school environment. Pre-service teachers gain experience by being mentored and guided by in-service teachers. We believe that what makes this a viable model is that in addition to learning needed skills and gaining experience, in-service teachers view their participation in our program as an efficient and practical means for earning technology credits and re-certification. Rather then attending a class or workshop for a few days to enhance their technology skills, teachers are actually integrating their learning experiences into their own classroom, as they are learning technology skills. In short, we have provided a real world, semester long program with actual hands on experience. Mentoring is a key component of this model. Pre-service teachers are available to instruct and assist in-service teachers in learning to utilize Blackboard and a wide range of other programs. Each pre-service teacher is required to maintain a minimum of six online office hours per week. Pre-service teachers are also required to make a minimum of three visits per semester to the in-service teacher's computer lab where they will act as lab facilitators and will be evaluated at the end of the semester by their in-service mentors.

Our experience has clearly indicated that simply telling teachers or university faculty to use technology is simply not going to work. Arguing for the existence of the "information age" is not an agent for basic changes in curriculum or in instructional methodoly. What does work is not only pointing out to pre-service teachers the value of hands on experience that includes first hand interactions with students in a computer lab, but actually giving them the opportunity to do so. In-service teachers are already overburdened with a wide range of responsibilities to the extent that they frequently view acquiring technology skills as just another time consuming task. Even more problematic is that traditional technology seminars are physically removed in both space and time from their students, classrooms and from the curriculum they actually teach. Often, teachers forget new technology skills by the time they return to their classroom.

Clearly, pre-service and in service teachers enrolled in our model find that not only are they able to integrate new skills as they are learning them, but that they are functioning in an environment that actively encourages contemporary teaching behaviors and practices such as co-investigating and team learning activities. In service teachers are learning, pre-service teachers are learning, and students enrolled in the classroom are learning. I would like to conclude by pointing out that all of the technologies used in our program have been around for quite some time. The development strategy utilized by The Technology Outreach Project was based on a cultural model that took into account time management and needs assessment. Our objective was to integrate the needs of three separate groups of learners by implementing technology as a tool to accomplish specific goals. We were not interested in using technology as an enhancement or simply for the sake of learning to use technology in the isolated, and frequently sterile environment typical of many computer workshops and short courses.

# WebQuest Collaboration for Special Needs Awareness

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**Abstract:** This poster session focuses on a collaborative project for students in preservice education that combines technology integration and special needs awareness. Students designed a WebQuest in the technology integration course and students from the Special Needs course became the non-expert reviews. The non-expert review process was used to evaluate the WebQuests on their design for students with disabilities. Based on the evaluation, the planning for the next semester's projects began to take into account the Universal Design Learning Principles.

## Introduction

Today, teacher education programs have numerous responsibilities to provide teachers with a comprehensive preparation that includes content, methods, classroom management, special needs and technology. In our teacher education program technology (2 credit hours) and special needs (1 credit hour) are both offered as required courses but with minimal credit hours attached to them. Thus both courses have difficulty covering all comprehensive relevant content that is necessary.

Two instructors, one teaching the technology course and the other teaching the special needs course, have been working together in the area of Universal Design Principles of Learning. A plan was developed to incorporate the WebQuest Process into both courses with collaborative components. This paper describes the collaboration efforts between students in both classes.

## WebQuest

A WebQuest is "an inquiry-oriented activity in which most or all of the information used by learners is drawn from the Web" (Dodge, 2001). WebQuests consist of a task that engages students in authentic problem solving using prescribed processes and requiring some final product in which the web resources can be synthesized. The WebQuest process is used in the technology course as one of the means to fulfill many of the International Society for Technology Education Standards Professional Performance Profile indicators. The technology course has used this format in the spring 2001 semester and found that students really enjoyed the process and could demonstrate ISTE proficiencies. The only proficiencies not easily met were the exposure to Universal Design for Learning principles and assistive technology and along with the opportunity to peer teach their lesson.

## Universal Design for Learning Principles

Universal Design for Learning Principles is the design of instructional materials and activities that allows the learning goals to be achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, organize, engage and remember (Orkwis & McLane, 1998). The principles for universal design include multiple representations of content, multiple means of expression and control, and multiple means of engagement (CAST, Universal Design for Learning). Universal design implies the use of technology in curriculum materials as the content is in digital format. Technology allows teachers the ability to meet the universal design principles by providing various mediums to compensate for the differences in student's skills and abilities.

## The Collaborative Process

The idea of working together to provide exposure to both technology integration and special needs was an intriguing one but could we pull it off? In the technology course, the overriding consideration was that students needed the opportunity to gain an understanding of technology integration as it applies to a classroom. According to the International Society for Technology in Education (ISTE) Standards for Professional Performance Profile indicators (2000), students needed to be more aware of the various learner needs as they integrate technology into curriculum. Students also needed to have an opportunity to evaluate curriculum materials in order to explore the various methods they could use to provide materials to all students in the format they needed.

The other consideration in this project was the collaborative aspect. Many teachers work closely with other professionals regarding students with special needs and this requires a collaborative relationship to best meet the needs of these students. In doing this project, students would get a better understanding of how this collaboration could occur.

The needs of the classes were also discussed. The technology course was looking for "expert" evaluators for the WebQuest projects and the opportunity to introduce some of the universal design of learning principles into the curriculum. The special needs course really needed practice in identifying materials that could be adapted and determine strategies of how materials could be used effectively.

Coordinating the project was not easy. Because of the program structure, both courses contain students who have varied backgrounds and responsibilities. There are students from a secondary education program, students with a K-12 emphasis and early childhood students in both courses. There was a concern that the material they would evaluate may not be at their particular grade level.

The special needs students were introduced to assistive technologies. Students were then introduced to WebQuests by examining Bernie Dodge's WebQuest Site. Based on the exposure to the WebQuests and the rubric the instructors developed, students were asked to examine a specific WebQuest being build by the technology course. Students were looking for multiple items.

## Conclusions

The outcomes of the project are anticipated to be a better quality WebQuests due to the feedback opportunities. The students should also have an understanding of how technology integration can enhance opportunities for students with diverse learning needs. The evaluation process is also important for the students in seeing how constructive feedback through collaboration can provide both parties with a product that can be used for multiple purposes.

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# Guiding Principles for Technology and Teacher Education

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**Abstract:** How does a teacher education program begin the process of integrating technology? This paper provides a framework for technology integration that incorporates guiding principles, technology standards, and the developmental stages of teacher education. Additionally, the paper discusses that technology integration must be more systemic than just teacher preparation and must involve educational administration and special education. For technology integration to be successful, it needs to be implemented in an environment of strong leadership and where a technology vision and infrastructure are in place.

## Introduction

While school systems and other organizations are working hard to meet the training needs of those teachers already in service, teacher education institutions must guarantee schools that all newly employed teachers will be able to use technology well. Unfortunately, the reality is that there is a deficit in the teacher education community to be able to ensure that technology competency of graduates (NCATE 1997; RTEC Consortia 1998; Moursand & Bielefeldt 1998). Schools and departments of education (SCDE) need a guide to determine what their own technology integrated programs can look like.

## A Framework for Teacher Education

There are numerous ways that an SCDE can bring technology into its teacher education program. Some programs elect to use a stand-alone course to introduce technology skills and applications. Other programs may elect to put technology components and instruction into a variety of courses. A few programs are able to use a university-wide technology competence requirement for skills, and then focus on educational application in later courses. The variations can seem endless and there is good reason for it. In other aspects of teacher education, an SCDE seeks to establish a focus of specialty. Some programs feature a strong liberal arts education with a fifth year for teacher education. Others may extol their excellent field experience. It is these variations that may programs unique, interesting to students, and provide outlets for their faculty. The systematic integration of technology into teacher preparation therefore needs to take these differences and points of excellence into account and complement them. There is not a "one size fits all" approach that can be used with technology integration; however a guiding framework can be used to make technology an enhancement to the program.

A graphical representation of this framework is shown in Figure 1. The framework is provided as a model that can be used and modified to suit a program's need. First, there needs to be a base upon which all other elements are built and integrated. For many SCDEs this might be a knowledge base, or a set of guiding principles, or perhaps a set of standards that a state has adopted. This example uses the INTASC Principles (Interstate New Teacher Assessment and Support Consortium). These ten basic principles have been adopted for teacher preparation by numerous states and have served as a catalyst for the development of state-specific teaching standards. The principles are a thread that weaves throughout the teacher preparation program and cover areas such as content knowledge, child development, learning differences, instructional strategies, motivation, communication, planning, assessment, reflection, and community. These are foundational elements that are present to varying degrees throughout teaching programs.

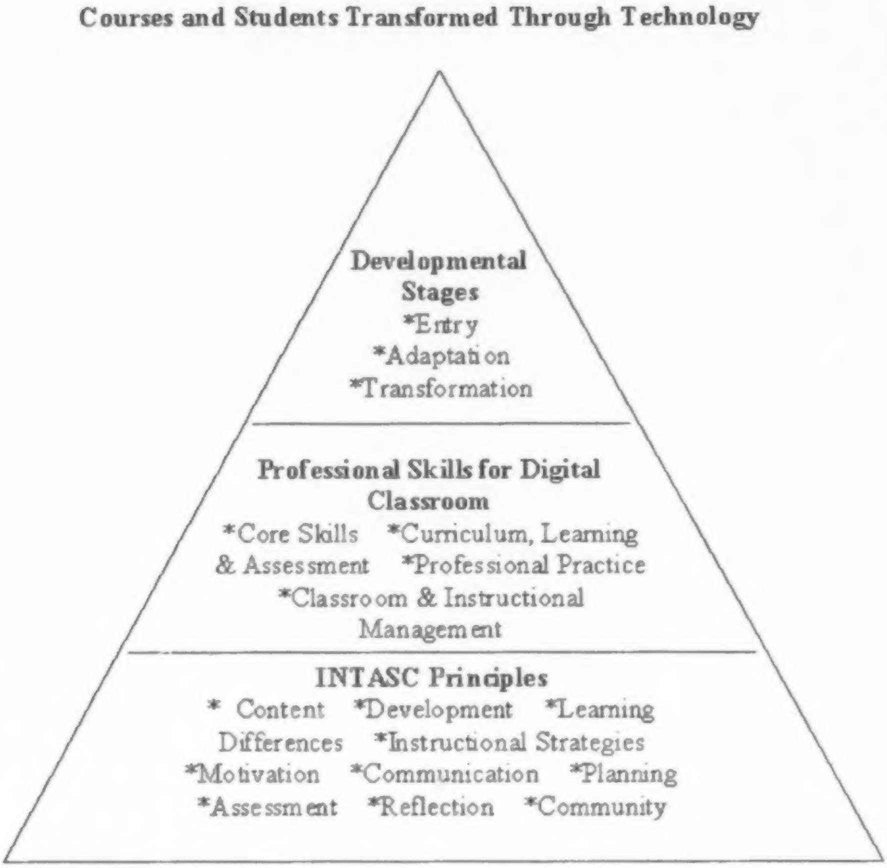
Courses and Students Transformed Through Technology
Developmental Stages
*Entry
*Adaptation
*Transformation
Professional Skills for Digital Classroom
*Core Skills *Curriculum, Learning & Assessment *Professional Practice *Classroom & Instructional Management
INTASC Principles
* Content *Development *Learning Differences *Instructional Strategies *Motivation *Communication *Planning *Assessment *Reflection *Community

Figure 1: Framework for Teacher Education

The next level of the framework builds upon this foundation by introducing a set of technology expectations or standards. These standards could be nationally recognized such as the Professional Skills for the Digital Age Classroom (Milken Exchange on Education Technology, 1999) or the ISTE National Educational Technology Standards for Teachers (2000). Alternatively, a SCDE might have formally adopted its own set of technology standards. Whichever path a SCDE elects to take, these standards need to be joined in with the foundational elements – this becomes one of the essential pieces to integration.

Finally, a SCDE places on the top of the framework the stages of the teacher education program and the unique nuances of that program. For instance, there is a beginning stage to teacher education, when a student is first exploring the field. Just as the elements in regard to the INTASC principles are covered in different depths and with different types of experiences, so to should technology. As a student moves to more advanced courses, the expectations of technology application should also become more advanced and reflect more of the advanced principles and standards. With technology, a student will move from the observation of technology-rich classrooms or learn the basics of application skills to using the technology in the field for assessment and differential learning strategies. This presentation will provide a more detailed look at the framework and the types of integrated activities that support the framework.

## The Case for Special Education

Technology for special education is worth separate mention because of the different technologies available and the different training and opportunities provided. Recent philosophical changes in the field of special education, coupled with legislative amendments have lead to widespread inclusive education. Although paraeducators, or special education teachers are often available to help the classroom teacher, s/he must be ready to use the available assistive technologies to help students achieve learning goals. The Council for Exceptional Children has developed a set of core technology competencies that beginning special educators that lay a foundation for a technology curricula (2000). Furthermore, the ISTE National Educational Technology Standards for Teachers (2000) also suggest that prior to a student teaching experience that all candidates be able to identify and use assistive technologies.

## Preparing Educational Administrators

SCDEs prepare teacher to go out and teach in schools. However, they are not alone in the schools with the students; their work is guided and often managed by the administrators present in the school and the school system. Technology will impact the role of school administrators as much as teachers, if perhaps in a different way. Administrators need to be aware of the technologies that teachers can use to impact teaching and learning and be prepared to facilitate that work. Administrators also need to be able to use technology to document and report out the teaching and learning that occurs within each class, building, and corporation. Technology has the power to influence and impact the daily work life of an educational administrator, and in order to ensure that the administrator has the capacity to use that available power, SCDEs that prepare educational administrators must be prepared to integrate technology into their programs as well and to help their students understand the role technology plays in the 21st century classroom.

## A Systems Approach

What should be clear from all of the above information is that technology is not mutually exclusive to segments of teacher education or the SCDE as a whole. In order to integrate technology into the mission and very core of an SCDE, a systematic approach must be considered. However, the system includes more than the programs. An SCDE must first have a vision for how technology will manifest itself in the programs and the desired outcomes. There must also be strong leadership within the SCDE to build the necessary vision, provide the leadership to guide the curriculum development, guide faculty and student competence with and use of technology, reach out to alumni and community, and to build the necessary SCDE infrastructure. And as strong as that leadership might be within the SCDE, it alone will not be enough. There must be campus-wide leadership that recognizes and acknowledges that the successful preparation of a good educator is the task of more than just the education program because a campus-wide infrastructure for technology must also be in place and the necessary support must be provided to the SCDE.

## Conclusion

The integration of technology should not and cannot become the purview of a few individuals. To create a SCDE that successfully employs technology, all members of the unit must be involved. The systemic effort extends beyond the program to all those who teach and work with the program. Not only the instruction, but also planning and evaluation must be systematized by the SCDE. It is also not a process that will happen overnight or show immediate widespread results. Technology integration is an evolving process, and the vision and infrastructure will take time to grow. The evolution will continue as the technology changes and user sophistication increases. This evolution will provide yet another opportunity for a SCDE to develop and find its distinctive niche in the preparation of educators.

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# Understanding Teachers' Purposes for Using the Internet with Their Students

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## Purpose

The purpose of this paper is to better understand the different purposes teachers have for using the Internet with their students. It utilizes Bandura's theory of self-efficacy as a framework to conduct a study with experienced teachers.

Consideration of the purposes teachers have for Internet use with students is important when considering the potential of the current investment of money related to the increase in school-related technologies. According to one report, $5.4 billion was spent on computers and related infrastructure in 1999 (Ballard, 2000). The federal government estimates another $5-10 billion per year as the cost for maintaining and improving those infrastructures.

More importantly, we need to realize the potential this technology can have in helping train students to become prepared for the Knowledge Age. At the end of the 20th century, computer technologies, particularly the Internet, revolutionized the American household and workplace. It has only been ten years since the U.S. spending for Industrial Age capital goods was exceeded for the first time by the spending for Information Technology (Trilling & Hood, 1999). According to some educational researchers, this marked the first year in a historic shift from the Industrial Age to the Knowledge Age (Stewart, 1997). This turning point to a new age requires a renewed examination into education and its purposes for society.

The present study focuses on answering the following research questions: 1) What kind of educational purposes do teachers have for using the Internet with their students? 2) What is the nature of the association, if any, between teachers' confidence for using the Internet with students (Internet Teaching Efficacy) and the purposes for Internet use with their students?

## Theoretical Framework

Self-efficacy theory is helpful to use as frame to better understand both the quality and quantity of teachers' integration of Internet use with their students. Bandura (1997) understood self-efficacy as an individual's judgment of one's ability to complete future actions. He contended through his theory that humans are active participants in producing behavior and that they exercise control over their own destinies. In his description of social cognitive theory, he suggested that the full understanding of human behavior required an integrated causal perspective in which social influences operate through self-processes that produce actions.

Personal Teaching Efficacy is a specific form of self-efficacy. The construct of Personal Teaching Efficacy, a specific belief about one's ability to teach, has been used by researchers to describe the mediating effects one's beliefs can have between knowledge or skill and one's actions. A teacher with high efficacy, for example, would persist in the face of obstacles and rebound from temporary setbacks.

Bandura's theory of self-efficacy, therefore, provides the framework in which we can examine the role beliefs have in a teachers' selection or creation of Internet activities they may use with their students. A scale assessing teachers' beliefs about using the Internet in the classroom has been recently developed and follows Bandura's claim that self-efficacy is task-specific. Understanding this belief about using the Internet with students is an important factor that has been overlooked in previous studies related to Internet use.

*The role of purposes.* The purposes a teacher has for engaging students in an Internet activity can vary widely. One research report on the effectiveness of technology in schools reported "goals of instruction" as one of four factors contributing to the effectiveness of use (Software and Information Industry Association, 1999). According to Copeland et al, (1994), beliefs about educational purposes is a central way to understand how teachers interpret and understand classroom events and has been linked to a part of a larger system of beliefs and perceptions generally referred to as a teacher's "practical theory".

## Methods

### *Participants*

A purposeful sample was chosen so that information-rich cases could be examined. Patton (1990) describes the type of sample obtained for the present study as "criterion sampling". Each of the participants will provide information-rich data since all will have been predetermined to have the following characteristics: 1) participate as master teachers in partnership with a large university, 2) use the Internet with students for educational purposes at least several times a year, and 3) teach in grades 4-8.

### Data Sources or Evidence

An initial survey was given to 120 K-12 cooperating teachers. Teachers were given a choice to take the survey in either paper or electronic (online) form. The purpose of the survey was to collect data about each teacher's technology ability, amount of Internet use with students, and level of efficacy for using the Internet with students. Twenty-five teachers were found to meet the criteria listed above and became participants in the study.

A semi-structured interview guide was used to elicit information for three general categories: background information, context of use, and purposes for using the Internet with students.

An established coding procedure developed by Copeland & Caston (1994, 1998) was used to categorize purpose statements as "broad" or "narrow". An example of a narrow purpose would include concern with students' cognitive thought typified by simple recall. A broad purpose would be considered a response related to such a concern as the development of a student's ability to proceed in a learning task independently. These tend to mainly be related to pupil-oriented responses. Teacher-oriented purposes are considered a separate category of responses not sub-categorized as narrow or broad. However, over ninety percent of responses discovered by the authors mentioned above were associated with the pupil-oriented category (Copeland & D'emidio-Caston, 1998). The focus of the present study is primarily on understanding the differences displayed among the ratio of broad purpose statements with total number of purpose statements among teachers.

The second interview will utilize what Patton (1990) describes as "illustrative extremes" to access information regarding beliefs about confidence and purpose for teachers' use of the Internet with students. Illustrative examples of Internet use with students will be created based on levels of purpose for use. One example will have an extremely narrow, while the other would contain an extremely broad purpose.

### Results and Conclusions

Preliminary results of survey and interview analyses indicate that a relationship exists between teacher's purposes for using the Internet and their Internet Teaching Efficacy. Specifically it was found that teachers who have higher Internet Teaching Efficacy include broader purposes for using the Internet with students. Specifically, the majority of teachers who had higher Internet Teaching Efficacy included in their description of the lesson the notion of information literacy, while those that had lower Internet Teaching Efficacy did not. This finding of mentioning information literacy, or including as a purpose the students ability to locate, select and choose sites for relevance and accuracy, was categorized as a broader purpose using Copeland et. al's categorization scheme. This could be a fundamental shift in the way that higher Internet Efficacy Teachers view learning in general or learning through the use of technology such as the Web.

The present study includes a specific sample of teachers in partnership with UCSB as cooperating teachers and included a relatively small number of participants. Therefore results should not be generalized to a broad population. It does, however, provide an interesting window into the uses and motivations behind using technology and suggests that further studies should be conducted.

### Educational or Scientific Importance of the Study

*Teacher education issues.* Besides adding to the existing research base on efficacy and technology use of teachers, it may be helpful to know what type of preparation is necessary for teachers under current contextual conditions. For example, it may be important to determine whether one should specifically consider addressing efficacy in the preparation of teachers. If the purpose for using technology by teachers differs not just on skill but by efficacy, then one would assume that along with proficiency workshops, support for specifically increasing one's computer or Internet efficacy would be necessary.

*Program implications.* Teacher education programs may need to consider that providing a strong knowledge base of content and pedagogy may not be sufficient to help teachers grow and succeed as professionals. Many researchers suggest that teacher education programs should be revised to incorporate this notion of explicitly acknowledging the beliefs teachers bring with them to a program (Ashton & Webb, 1986; Hollingsworth, 1989; Ross, 1995). Although not aiming explicitly at developing a teacher education program intervention, the results of this study may help to develop an understanding of the role teachers' beliefs have in the purposes teachers have in using the Internet with students. It is hoped that this new knowledge will help programs appreciate the need for a focus on providing not just skill but opportunities to enhance one's efficacy.

*The cost and potential.* Considering the cost of having Internet compatible computers suggests the nature of its purpose should be greater than that of drill and practice. Besides the cost involved with such a resource, many agree that teachers should employ methods to increase the use of technology as a tool to support higher order thinking skills with their students. Several studies specifically state the importance of higher level thinking as a necessity for survival in a rapidly changing world (Lee & Dinkins, 1998; Paul et. al., 1990). This study supports the notion of including higher level or broad purposes among the existing low/ narrow purposes of teachers: although like other, it does not state to what degree they should be employed. However, in order to reap some of the benefits of the great expenditure related to technology, this paper argues that more teachers must use technology for higher purposes, so that technology can be transformed from the token and peripheral aspect of the classroom it is today.

# Web Resources for Student Teachers

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Examining the best, easy to use, and free resources for student teachers to integrate into their teaching

This interactive session allows participants to experience the best the web has to offer for student teachers. Most of the time will be spent on reviewing interactive activities for students, resources for teachers such as lesson plan and photo galleries, and powerful online applications that can be used immediately. All of these resources are located on an independent, easy to use web portal. The focus will be on how these resources can be implemented in methods, technology, and other teacher education program courses to help facilitate the use of technology in the student teachers' placements.

Students belonging to an education program may be generally aware of the wealth of information that is available to them via the Internet. Many of them interact with the Internet daily in order to meet certain needs or gain access to specific information. Unfortunately, many student teachers are not incorporating that use of the web in their coursework or placements. One possible reason for this is that they may not be cognizant of the multitude of free activities and applications designed specifically for teachers and their students.

During this session, participants will be able to interact with web resources in order to: access student activities such as WebQuests, gain access to thousands of lesson plans, create a website, utilize a rubric generator to create a rubric, and design their own personalized web quests, quizzes, and games. Discussions will focus on how to best integrate these on two levels. First, university instructors need to model appropriate use of these resources and begin to demonstrate their effectiveness in their own courses. Second, we will share how student teachers have used the resources in their school site placements to help meet the technology standards required before receiving the California Teaching Credential.

Participants do not need to have any prior knowledge or experience with technology to be a part of this session. The main web site used for this presentation can be found at:
http://www.freesites4teachers.com

# Technology, science and preservice teachers: Creating a culture of technology-savvy elementary teachers

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**Abstract**: The purpose of this study was to explore how preservice teachers incorporated technology into a microteaching activity that was a component of their science education and educational technology course. The preservice teachers displayed various levels of technology use ranging from additive and nonessential to being an integral aspect of the lesson. Four use of technology emerged; as knowledge source, data organizer, information presenter, and facilitator. In our presentation we will discuss microteaching as a tool in teacher education and share the preservice teachers' efforts to integrate computers and other related technologies in the teaching of science.

## Introduction

There is no doubt that technology has strongly influenced the course of history and the nature of human society. Schooling has also been influenced by this increasing wave of new technologies. As a result, both science and technology educators have articulated the importance of understanding such technological advances and their relevance to teaching and learning in general and science in particular. In an article discussing the implications of science and technology interaction on scientific literacy, Cajas (2001) commends the science education community in taking a strong step toward including technology studies as part of science education by selecting and clarifying specific technological concepts and processes relevant for scientific literacy. The National Science Education Standard (NRC, 1996) recommends that technology in the classroom should provide opportunities for students to investigate science content beyond superficial levels, establish connections between the natural and designed worlds and provide students with opportunities to develop decision-making abilities. This is supported by the recommendations of the National Council for Accreditation of Teacher Education (NCATE) and the National Educational Technology standards (NETS) that seek to define standards for integrating curriculum, technology and technology support. NCATE stipulates students at the preservice and graduate levels in teacher education are prepared as 21st century teachers. They should be able to design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

As the debate surrounding technology and its role in teaching and learning intensifies, and as technology becomes more pervasive in society and more available in schools, the focus is on teacher educators to prepare preservice teachers with the capabilities to effectively integrate technology into their teaching. Many possibilities exist for the integration of educational technology into the curriculum and most content-specific governing bodies include statements related to effective technology integration (Churma,1999).

With the goal of creating a group of technologically savvy elementary teachers, both the science educators and educational technologists collaborated intensively during the 2001 spring semester. The purpose of this study was to explore how preservice teachers incorporated technology into a microteaching activity that was a component of their science education and educational technology course. In our presentation we will discuss the microteaching as a tool in teacher education and share the preservice teachers' efforts during their teaching activities as they integrate computers and other related technologies in the teaching of science.

## The Program

In the seventh semester of the teacher education program, students are enrolled a science education, mathematics education and educational technology course. This semester is referred to as the

Math, Science, Technology (MST) block and focuses on individual pedagogy and content of the three subjects while emphasizing their integration as an important component of teaching and learning in elementary classrooms. Throughout the semester, efforts are devoted to developing teaching and learning activities aimed at achieving integration across the three subject areas in the inclusive elementary classroom. This is accomplished through collaborative planning among instructors and the administration of common assignments.

One common assignment is the microteaching activity. Students develop and teach a thirty-minute lesson that integrates math, science and technology. The lesson is developed for a grade level of their choice and is correlated to the state's curriculum standards. Students submit the written lesson plan to the instructors on the day of the teaching and make the necessary arrangements to acquire the technologies needed. These lessons are taught to their peers and observed by the math, science and technology instructors who provide feedback on lesson development, content, questioning and classroom organization strategies and the appropriateness of the technology used. The feedback from each instructor is compiled into one document and students receive one common grade for each of the three courses.

## Data Collection and analysis

Data collection methods included observations of microteaching, analysis of lesson plans and content of both instructor feedback and student reflections. These multiple methods of data collection were used to triangulate the themes of technology use that emerged during analysis. Rigorous content analysis occurred as we examined the students' words and actions, (Maykut and Moorehouse, 1994) and categorized the use of technology in a variety of ways to understand the preservice teachers' perspectives on technology integration and the teaching of elementary science.

## Findings

Four themes of technology use emerged: (1) technology as a knowledge source, (2) technology as data organizer, (3) technology as information presenter, and (4) technology as facilitator.

### Technology as knowledge source

Many lessons used the WWW as a source of information. This was characterized by pre-determined websites, worksheet style questions, and, in most cases, lower level thinking skills. For example, in a grade three lesson, the preservice teachers provided bookmarked websites on clouds, required the group to observe the types of clouds shown, and read the information given. They then drew the clouds as seen on the computer screen, and provided responded to worksheet questions as they documented the characteristics of each cloud. These worksheets were then pasted in their science journals to become part of their science notes.

In other lessons, a number of sites were pre-selected and this information then became the focus of the lesson. In a lesson on bald eagles, students were organized into groups and each given a folder, four questions and a list of websites from which to elicit the information. The next step of the lesson as observed and documented in their lesson plan showed the importance of the technology in providing the knowledge. The plan states: …"When all groups have completed the questions, the class will come together for discussion. Each group will be given the chance to explain their answers to questions three and four (all the questions if we have time). The teacher will then give a summary to the discussion about the causes for population decrease of bald eagles". In another lesson, students were provided with the software "A World of Plants" and were instructed to listen to the story on seeds and use the information to answer the questions on the investigation sheet.

As indicated in the examples, there was a heavy reliance on the technology to provide the content knowledge for the lessons. The learner involvement became one of reading and writing the information that was then used in whole group question and answer sessions, with the teacher highlighting the main points. The preservice teachers had merely substituted the traditional textbook and allocated a large amount of time to copying information from the technology rather than involving the learners in meaningful science activities.

### Technology as data organizer

Many lessons involved collection of numerical data such as recording temperatures, densities, and masses. Some students used technology in the form of spreadsheets or databases to organize this data.

These lessons typically involved small groups collecting and inputting data, which was then compiled into a whole class document. In a lesson on Healthy Heart, students recorded their pulses at rest and after running in place for two minutes. These data were then recorded onto a spreadsheet that was set up in advance by the teachers. Bar graphs were then constructed from the data with the teachers asking the students to observe the graphs. In another activity on computing density of candy bars, the same format was followed. The teachers had the spreadsheet already outlined and the students went to the computer and added their information in the appropriate columns.

While collection and imputing facilitated observation of whole class data, students showed significant weaknesses in their ability to involve the class in data analysis and in the use of other skills such as extrapolating and making predictions from the trends and or patterns indicated. In some cases, they struggled with converting from the tabulated information to the appropriate graphs and showed weaknesses in manipulating the technology to construct the graphs. Some students literally fell apart when they attempted the graph construction and the steps were not indicated in the plans they were following. However, other students stepped forward to assist, demonstrating that among the group there were different levels of skills and confidence with technology use.

**Technology as information presenter**

This was the most common use of technology among the preservice teachers during the microteaching activities. Many of them simply used the computer as a glorified overhead projector; paying special attention to colors, fonts and transitions. While presentation software lends itself to nonlinear forms of communication; students utilized it in a linear, lecture-based fashion. Students learned how to develop PowerPoint presentations and were able to vary sound and colors and to import images. In most cases, hands-on activities were incorporated into the lesson. However, the technology was used for information presentation and subsequent fact recall on prepared worksheets. Few deliberate attempts were made to make the presentation relevant to the hands-on activity. In a lesson on leaves, students were provided with a leaf and instructed to measure the length and width and to observe the veins using magnifying lens. This generated many activities at each worktable but with the introduction of the PowerPoint students merely sat, watched and listened to the information being given about leaves.

**Technology as facilitator**

Active involvement in learning science is a hallmark of the National Science Education Standards. They advocate for the learning of science as inquiry as a central learning goal for all students and state that this cannot be met by having the students memorize facts. It can be met only when students frequently engage in active inquiries. (NSES, 1996). In some lessons, the technology was used to facilitate the inclusion of a number of skills into the lesson. Some of these were allowing for observation and description, critical thinking and the construction of explanations. These were integral components in facilitating inquiry and were essential for the success of the lesson. For example, teachers took digital photographs of animals in their natural habitats displaying various kinds of camouflage. These images were projected via presentation software and formed the basis for the discussions on how animals use camouflage as a survival mechanism. Students were instructed to observe, talk among themselves about their observations and to recognize and construct explanations why camouflage was important to the animals being observed. Their responses were solicited in a whole group discussion and the preservice teachers facilitated higher order thinking skills as they interacted with students.

Another lesson began with students sharing their experiences about a trip made to a lake, pond or to the sea. The preservice teachers then projected an image of a group of individuals floating in a body of water while reading and doing other activities. The class was asked if this was similar to their experiences and were instructed to suggest reasons for the phenomenon being observed. Students were given time to observe and think and then a discussion around the pictures solicited the students responses which were written on poster papers and hung to one side of the room. The lesson continued as students placed eggs in pure water and in salt solutions of varying concentrations noting that the more concentrated the solution the higher the eggs floated. Using the questions developed from this activity, students developed hypotheses about density. At the end of the lesson, the image of the floating people was again projected and students were required to write their own explanations of the occurrence.

## Discussion

The goal of this study was to explore how preservice teachers incorporated technology into their integrated lessons during their microteaching activities. Our results parallel findings in K-12 classrooms with inservice teachers and technology. The preservice teachers displayed various levels of technology use ranging from additive and nonessential to being an integral aspect of the lesson. Four use of technology emerged; as knowledge source, data organizer, information presenter, and as facilitator. Preservice teachers also displayed differing levels of competence with the technology. Some were unable to deviate from the lesson plans and showed signs of nervousness and apprehension in instances when things did not go as planned while in such instances, other students were eager to lend a helping hand

The microteaching allowed the preservice teachers to bring together some components of good teaching including curricular integration, reflection and content-specific uses of technology.
We observed the use of the technologies in a variety of ways, ranging from simple presentations to computer simulations, resources for content and spreadsheets for data recording, analysis and constructing graph. In addition, further analysis suggests that the preservice teachers were beginning to value the use of computer technology in teaching science in elementary classroom. Many reported in their reflections that they had developed some level of comfort with using technology in their teaching. In part, they had developed an appreciation for technology as a tool to facilitate the learning of science. These results also offer clues and direction related to efforts to sensitize and expose preservice teachers to the use of technology in teaching and will provide a framework for us from which to consider our efforts to prepare technology-savvy science educators.

## Conclusion

The study provided support for collaboration between content-specific teacher educators and educational technologists. Preservice teachers were engaged in the use of technology as a teaching tool and consequently developed new perspectives on the use of technology in their teaching. However, a crucial and obvious component to incorporating technology advances in the classroom is to ensure that teachers are comfortable and knowledgeable with its use as a tool to facilitate learning. The development of a cadre of teachers armed with the capabilities to effectively integrate technology into the teaching of science in elementary schools will require the integration of technology into the science education course and the ability to work through simulated teaching experiences such as a microteaching activity.

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# *TECHNOLOGY & EDUCATION*
## *THE RESEARCH ON WHERE WE HAVE BEEN*
## *A VISION OF WHERE WE ARE GOING*

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*If we want teachers to create exciting and engaging learning contexts which respects all students' right to learn, the best way to do this might just be to create exciting and engaging learning contexts for teachers that respects their ability to shape education.*
(Riel, 2001.)

One major finding of the 1998 *Teaching, Learning, and Computing Study* (Becker & Riel, 2000) was that the role of the student as a learner in the classroom mirrored the role of the teacher in the larger educational community. Students in classes taught by teachers who were engaged in a range of professional development endeavors are asked to think deeply about issues, generate their own ideas, work collaboratively on projects, share and evaluate their own work in a public forum, and use technology to support these types of activities. This finding points to the need to create learning experiences for educators that reflect the learning environment we want for our children

Produced by the Research Center for Educational Technology at Kent State University, the CD-ROM, *TECHNOLOGY & EDUCATION: THE RESEARCH ON WHERE WE HAVE BEEN • A VISION OF WHERE WE ARE GOING,* is designed for university faculty working with preservice educators, staff developers in a preK-12 environment, and practicing teachers engaged in study groups. The purpose of this session is to demonstrate the use of an interactive CD-ROM that was developed to actively engage teachers in reflective dialogue regarding best practice research, their teaching philosophies, and instructional practices.

Session participants will have the opportunity to navigate the CD-ROM as facilitators guide them through the layers of information. Facilitators will also report on the usage of the CD-ROM since its release in August 2001 and feedback that has been received from educators both at the university and K-12 level. Some of the primary users of the CD at this time are teaching faculty that are involved in PT3 initiatives.

The content of the CD-ROM illustrates how technology is changing our lives and our schools. A video message by Dr. Thomas Carroll, former Director of the *Preparing Tomorrow's Teachers for Technology* program, addresses the issue of teachers and their changing role in the classroom. Dr. Linda Roberts, former Director of the Office of Educational Technology for the United States Department of Education, speaks to the importance of research in educational technology.

The CD takes an in-depth look at current research findings on the impact of technology on teaching and learning. Dr. Henry J. Becker & Dr. Margaret Riel (University of California at Irvine), who conducted the research on the *Teaching, Learning, and Computing* study, talk about the significant findings of this work. Dr. Rob Tierney (University of British

Columbia), one of the researchers in the *Apple Classroom of Tomorrow* (ACOT) project, shares results from his ACOT research.

The CD also provides real examples of how these important research results translate into the classroom. A series of guided discussion questions and related staff development activities can be accessed during the course of the CD. These can be used as a stimulus to engage educators in deep conversations about the implications that educational technology has for a real classroom. Content of the CD crosses all disciplines.

The creators of the CD strongly suggest that it be used in a discussion group setting where education professionals and/or teacher education students collaboratively study some current research and issues surrounding technology and its impact on teaching and learning. Viewers are challenged to call on their collective wisdom as practitioners to examine the value and potential of emerging technologies on teaching and learning.

The Research Center for Educational Technology (RCET) was founded in 1999 to provide a collegial network for university researchers and preK-16 educators committed to studying the impact of technology on teaching and learning.

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# ICT for Pre-service Teacher Educators

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**Abstract:** Pre-service teachers have diverse perceptions of ICTs in educational forums. This paper discusses one University's attempt to assist pre-service teachers to use and plan for ICTs as an integral part of the learning process for early childhood, primary and secondary students through their completion of a 1-semester course.

## Introduction

Treuhaft (1995) states that "Educational institutions do not exist in a vacuum", and as such we must reflect current trends in society. As technology pervades our society we must ensure our graduating students have the knowledge, skills and attitudes to educate our children to participate in tomorrows world. One of the underlying issues for teacher educators in 21st century is to promote the capacity of Information Communication Technologies (ICTs) to improve teaching, learning and assessment in classrooms.

In 1997, Education Queensland released their "Schooling 2001 Project". The aim of this project was to improve student learning outcomes though the integration of technology (Education Queensland, 1998). Funding was provided to state schools, to achieve a number of targets. These include: the use of computers in every classroom across all key learning areas and all year levels, school networks that give every classroom access to the Internet, and all teachers with a minimum level of skill in the use of computers for learning.

Funding, personnel and professional development opportunities were available to assist all teachers to reach the Minimum Standards for Teachers in Learning Technology (1998). These standards cover four main areas: IT skills, curriculum applications including classroom planning and management, school planning and student centred learning. It is expected that all practicing teachers in Education Queensland will achieve the Minimum Standards by the end of 2001.

## Context

In 2000, USQ introduced a course, "IT for Educators" as an elective course for teachers in response to Education Queensland's Minimum Standards for teachers. In 2002 this course will become a core course for all Bachelor of Education students. One of the benefits for our students taking this course is to increase their employability by Education Queensland, the major employer of our graduates.

Education students at USQ can now access ICTs in their pre-service education in four ways. Firstly, in first year students complete an "Introduction to Computers" course, which is taught by another faculty and is not linked to education. All students within the University complete this core course because it is seen as an essential element forthe employment future of all Australian professionals. Secondly, students can take courses in ICT's in education as a major (6 courses), a minor (4 courses) or electives. Thirdly, students are briefly exposed to ICTs in the context of their general study courses. And finally, the "IT for Educators" course is now a core part of the course for all Bachelor of Education students in the areas of early childhood, primary and secondary. This course gives pre-service teachers experiences to ensure students can demonstrate the Minimum Standards for teachers by graduation. Universities are unable to credential students and formal credentialling must occur when they take up their first teaching position in a State School.

The IT for Educators course comprises of the following major areas:

- Review of Basic IT skills: word-processing, file management, Email, Internet searching, PowerPoint, basic web authoring, and different forms of electronic communication;
- Discussion of Education Queensland's Policy and Guidelines for Using Computers in Learning;
- Demonstrating educational uses of the web; and
- Planning for curriculum and technology integration.

Students engage in individual and group activities both online and in person where they investigate the possible uses of technology in the field of education. Unfortunately many students have limited experience either using or observing appropriate use of technology in the classroom; this results in significant discussions regarding use of ICTs to support teaching, learning, assessment and administration within educational contexts.

Assessment within this unit takes several forms: a portfolio of samples demonstrating students IT skills, a short teaching session where students teach a IT micro-skill within a lab situation, contributions to multiple electronic communication forums, and the planning and preparing of a teaching unit or series of learning episodes where curriculum, literacy, and technology are integrated to solve a problem or perform a task.

## Conclusion

There have been significant developments in ICTs, their access and use in all educational facilities. Teachers' current skills, pedagogy, beliefs and attitudes will influence how the computer is used in their classroom. Sheingold (1991, p18) states "it is not the features of technology alone, but rather the ways in which those features are used in [the classroom] that shape its impact'. Prior to completing the course, pre-service teachers preconceptions regarding the use of technology in classrooms is usually limited to drill and practice use for fast finishers and word-processing of reports.

Rosenberg (2001) and others have stated that teachers must change from sage on the stage to the guide on the side. This course focuses on the new role of educators as being one of a facilitator or manager of learning rather than one of imparting knowledge. Students are required to create real or life-like tasks where the use of ICT is integral to the learning process and curriculum is student centred. Students are aware that how they use technology in their classroom after graduation is not limited to their personal IT skills and it will depend on the resources available, their personal pedagogical style and their ability to create a flexible learning environment.

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# Technology Integration: A Practical Model

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**Abstract**: The concept of technology integration has emerged as a key to effective use of technology in K-12 schools. This discussion presents a concrete model incorporating specific steps which teachers can follow when planning for technology integration.

To integrate means to make whole by bringing together parts. Thus technology integration as related to teaching may be defined as the act of utilizing appropriate forms of technology to enrich or complete instruction. Of course, use of technology may be more or less appropriate for given instructional goals and specific target audiences. Similarly, use of technology does not necessarily insure that instruction will be more effective than instruction which omits use of technology. However, many agree that technology—on the whole—is a "good thing," insofar as it holds high potential to enrich instruction, to motivate students, to further attainment of curricular goals, and to prepare students to survive in our technology-rich world. As always, one should avoid using technology just because "it's there," but should rather plan to use technology in ways that will truly have positive effects on students' learning.

## Learning with Technology: A Task Focus

What kinds of tasks are most beneficial for students when using technology to learn? The ACTIVE framework provides general guidance on the kinds of learning tasks that fit well with technology use (Grabe & Grabe, 1998). The framework describes the characteristics of learning tasks which are well suited to student use of technology:

1. *Active*: tasks should require that students transform information into personal knowledge;
2. *Cooperative*: tasks should require meaningful interaction among students;
3. *Theme-based*: tasks should allow for flexibility, should be multidisciplinary, and should be based on an organizing theme;
4. *Integrated*: tasks should emphasize content area knowledge and require use of technology tools to encourage learning that content in meaningful ways;
5. *Versatile*: tasks should make efficient use of technology skills and develop skills that can be reapplied later;
6. *Evaluative*: tasks should allow for assessment of students' ability to use the targeted skills and knowledge.

The ACTIVE framework provides useful guidance for educators in considering which kinds of learning tasks would most appropriately involve student use of technology.

## Steps for Technology Integration

What steps can a practicing teacher take to incorporate technology into teaching? There is no single, "right" answer to this deceptively simple question. The model presented here is derived from the author's personal experiences as a professor of educational technology and as an instructional designer. It is intended as a beginning point for planning for technology integration. Teachers should keep in mind that additional related insights may be gleaned from related literature and their own "trial and error" experiences (cf. Roblyer & Edwards, 2000; Grabe& Grabe, 1998; Jonassen, Peck, & Wilson, 1999).

Step 1. *review the technology landscape*: The teacher should first determine what technological resources are available at the school. Are open computing labs available? What resources are available in individual classrooms? Is portable or wireless equipment available on a pre-scheduled basis? Answering these questions is an important first step in the planning process.

Step 2. *identify the learners*: The teacher should next consider the characteristics of the intended learners. Thoughtful consideration of students' age, cultural background, reading ability, technological competence, and interests can improve the likelihood of successful instruction.

Step 3. *identify the curricular focus*: The teacher must pinpoint which curricular goal is to be addressed. It is important to keep in mind that instruction should focus on attainment of clear instructional goals and objectives, not upon development of technology skills in and of themselves although this can be an "added bonus."

Step 4. *specify the teaching team*: Although an individual can teacher can make effective use of technology with students, teachers should also consider a team-based, multidisciplinary approach under which teachers work collaboratively across multiple subject areas such as writing and social studies, or whatever.

Step 5. *specify the learning task(s)*: Here the teacher specifies the nature of the problem or project which will be posed to students. The focus should be on a traditional curricular student outcome such as understanding the water cycle or the three parts of the federal government. The timeframe for the instruction should also be specified. A rubric or other guidance explaining what students are expected to accomplish or produce should also be developed along with other supportive instructional materials.

Step 6. *specify how students will use technology:* Hand-in-hand with step 5, the teacher must determine how students will use technology to accomplish the task at hand.

Step 7. *learn to use the technology as students will.* The teacher must be able to demonstrate how students are to use technology and be able to guide them through the process. This requires that the teacher can actually perform the tasks expected of students and related preparation may be required.

Step 8. *prepare students for technology use:* Depending upon the level of students' existing skills, it may be appropriate for the teacher to spend some time instructing students on the actual use of required technology, though this is clearly not the overall purpose of the total instructional plan.

Step 9. *implement the plan with students*: This step is self-evident; the teacher tries out the complete plan with students.

Step 10. *evaluate results:* Here the teacher reviews student projects and collects attitudinal data to ascertain how students felt about the instruction, what suggestions they may have for improvement, and whether instructional goals were attained. Results should be used to revise the plan for next time.

In closing, the model suggested here provides a planning framework which teachers may use to begin their technology integration efforts. Teachers are encouraged to see additional related literature on this critical matter.

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# Infusing Technology in the Classroom: Positive Intervention Makes the Real Difference in Student Learning

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**Abstract:** The emphasis on technology as a tool for instruction has intensified as the public's belief and reliance on computers has increased. School districts are demanding that new teachers have the knowledge, skill, and expertise to integrate technology in public school classrooms to enhance student learning. This emphasis has required preparing institutions to re-evaluate, review, and restructure programs to ensure that new professionals have opportunities to practice integrating technology. The process of reviewing programs to integrate technology as an instructional tool is the first step to ensuring that new teachers are prepared. The second and most difficult step is to implement necessary changes into existing programs. At Robert Morris University, we have begun the process of review, implementation, and continued evaluation of our English education program that will allow our students to integrate technology into their classrooms as an instructional tool to increase student learning.

## Introduction

Infusing technology into classroom instruction is a major part of technology plans for most public schools, colleges, and universities today. The goal is to implement various instructional technologies and media for the improvement of student learning and retention. Education budgets at all levels reflect increasing monetary support for technology as the major learning tool. The issue, however, is not to use financial resources to provide technology as a "stand alone" educational add-on, but the effectiveness of using technology to improve student learning. It is important for new teachers to understand when and how to use technology to aid students' learning in classrooms to understand and apply concepts and information for various content areas. Specifically, new professionals need opportunities in their training to focus on discerning what technologies can be applied in various contexts and concepts to address student learning styles, interests, and specific subject areas and themes. As Dale Mann (1999) argues, technology does work—with some students and some of the time—not with all students all of the time. Teachers must be given opportunities to share, discuss, and experience appropriate ways to utilize technology in classrooms as they would any other pedagogical methodology. In this way, educators will go beyond using instructional technologies merely to justify expenditures to infusing technologies in a manner that creates a positive intervention in student learning.

Using technology as a positive intervention implies a conceptual understanding of technology as more than a motivational tool or a substitute for more traditional types of instructional methods or pedagogy. It means that technology must not be thought of as a reward for students who have finished their schoolwork. Understanding technology as a positive intervention means that teachers do not use technology for drill and skill programs for remedial students and a reward or enrichment activity for their gifted and talented students; instead, technology must be thought as a way to help all children, whatever their ability level, use technology in the same ways they use and are given access to other intervention techniques and methods.

Enabling preservice teacher candidates to have the experiences and information necessary to infuse technology in classroom planning and to understand its use as an intervention is a difficult task for many preparing institutions. Stand-alone college technology courses do not appear to help preservice teacher candidates understand how to infuse or integrate technology as a tool for learning. Our experiences working with both classroom teachers and preservice teacher candidates at Robert Morris University, has led to a shared concern that technology has become the primary goal while the pedagogical goals of the lesson are secondary. In these cases teachers use rather than infuse instructional technologies.

## Restructuring the RMU Program

In restructuring our program, the questions for us became, how do teachers design classroom instruction in ways that infuse instructional technologies for a positive learning intervention and how can we teach this to our preservice teachers? The answer lies in teaching careful planning. Lesson planning can follow a design format such as *ASSURE* (Heinich et al, 2000). This design formula considers such pedagogical factors as: anticipate audience (A), state objectives (S), select technology (S), utilize technology (U), require learner participation (R), and evaluate lesson (E). Certainly not unique, this formula follows a general blueprint for lesson plan design with one exception—integration of technology. In this model, teachers first anticipate the type of learners in their classrooms and second write the objectives for the class from a pedagogical point of view based on the specific course outline. Technology planning then occurs in the execution the objectives of the lesson. Thus, technology is selected to better facilitate the objectives of the lesson and the type of learners in the class. Next, the teacher must utilize the technologies in a professional manner. A fluid delivery helps to ensure learning; therefore, we require our students to practice their delivery. Finally, the preservice teacher with the help of the instructor and a videotape of the practice lesson reviews the objectives and determines the best way to assess the lesson and the learning that occurred within the classroom. Essentially, this design formula promotes a positive intervention of technology into teaching. The answer to our first question, then, was to use the *ASSURE* model in conjunction with our lesson plan design to help our preservice teachers infuse technology into their lesson plans.

How to teach the model was fairly simple, the difficult part became in teaching our preservice teachers when and how to implement technology as a learning tool, our second question. They understood and could generate lesson plans based on the *ASSURE* model, but could not evaluate the effectiveness of their use of technology on learners. Our challenge became how to help our preservice teachers know when they should and should not use technology in classroom instruction.

In deciding on the use of technology in the classroom, Zaho and Cziko (2001) noted that there are three conditions for teachers to consider using technology:

1. The teacher must believe that meet a higher-level goal than what has been used.
2. The teacher must believe that using technology will not cause disturbances to other higher-level goals that he or she thinks are more important than the one being maintained.
3. The teacher must believe that he or she has or will have sufficient ability and resources to use technology.

These three conditions must be met prior to the implementation of any instructional technology in the classroom. Using technology for the sake of demonstrating that technology was applied to the lesson but without regard to the fundamental or primary of objectives for student learning would certainly be a waste of time for students. A distinction must be made between using technology and integrating technology for learning. It should also be noted that many of the skills in computer technology require time, support, and colleagues to work with to move toward this integration process for effective lesson planning (Sheingold and Hadley, 1990). A positive intervention of technology in teaching is a matter of training, expertise, and creativity on the part of the teacher. It is a basically a process of delivery for the learning objectives.

Newman (1990) argues that educators must determine whether the technology intervention has changed or not changed the educational environment, and subsequently, the learning or pedagogical goals established by the teacher. The argument has been that technology stimulates or demands positive transformations in instruction (cf. International Society of Technology in Education, 1998; Means et al. 1993; Papert, 1993.) Research indicates that technology interventions have not produced the desired outcomes (e.g., Bruce & Rubin, 1993). The fact that teachers do experiment with the technologies inside and outside of their classrooms and the public's instance to provide instructional technologies in public schools should not, however, be the intended reason for using it.

Newman (1990) examined this issue of intervention and formulated the framework for six critical questions. These include the following:

1. What is the pedagogical goal of the lesson, and what pedagogical theory does it satisfy?
2. What is the instructional intervention that has the potential to achieve the identified pedagogical goal?
3. As the intervention is implemented, what factors enhance or inhibit its effectiveness in achieving the pedagogical goal?
4. How can intervention and its implementation be modified to achieve more effectively the pedagogical goal?
5. How has the instructional environment changed as a result of the intervention?
6. What unanticipated positive or negative effects does the intervention produce? (Reinkins & Watkins, 2000).

By using Newman's questions in conjunction with the *ASSURE* model, we thought our preservice teachers would be better prepared to evaluate the use of technology as an instructional tool for learning. The following sections examine the data we collected for evaluation of the program and the recommendations we have made for the future.

At Robert Morris University, all students are required to take two technology courses as part of their core requirements. In addition, our preservice teachers are required to use technology in many of their courses and educational requirements. We realized, however, that our preservice teachers were not required to carefully evaluate the use of technology as an instructional tool for public school students. Although there are several ways to help preservice teachers learn to evaluate their use of technology in the classroom, we decided that the best approach for our students would be to design a culminating component to their methods course that would enable them to first integrate technology into instruction, and then to "test" the effectiveness of that technology.

## Implementing the RMU Program

Our next step was to test and evaluate our belief that the *ASSURE* model and Newman's questions would help our preservice teachers make appropriate technology decisions. Through observations of presentations, interviews with the preservice teachers, and analysis of their lesson plans we were able to test our theory and evaluate our effectiveness of teaching the infusion of technology as a learning tool.

The course, Infusion of Technology in Classrooms, is taught as an integrated technology component for our preservice secondary English teachers during their Instructional Methods block prior to student teaching. 'Our students met with the instructor each Friday for approximately three hours. The initial sessions focused on understanding the application of instructional technologies in public school classrooms. These sessions, which were primarily hands-on, allowed students to review the basics of the technological skills they currently have and to build on these skills. Our students learn, for example, more sophisticated PowerPoint techniques for presentations, basic web design, integration of clip art and animation into presentations, how to write to CDs, and how to participate and set up threaded discussions. More importantly, our students learn how to apply these technological strategies to classroom discussions presentations, demonstrations, skill practices, simulations, and cooperative learning to positively influence student learning.

This component is taught in one of the university's presentation/laboratory classrooms. These classrooms are equipped with an instructor console that has a computer with Internet connection, a document camera, a microphone, two VCRs, a tracking camera (to tape student presentations), a CD player, and approximately 20 student computers with Internet connections. Teaching in these classrooms allows the instructor to demonstrate a technique and then have students immediately practice that technique. Our preservice teachers are familiar with using the equipment found in these presentation/laboratory classrooms. Approximately 70-80% of all classrooms at RMU have document cameras, computers, Internet connection, VCRs, and projectors for instructors and students to use for demonstrations, presentations, and instruction.

The final sessions focus on the infusion and evaluation of technology on instructional practice. In these sessions, our preservice teachers first design a lesson plan for their future public school students. Next, we ask them to integrate technology as an instructional tool in the lesson plan and link the technology to the specific objectives and method of the lesson. Often, this is the most difficult part of the course for our students. They are comfortable with the use of technology—many of them want to use as much technology as possible; however, they are not comfortable with evaluating its effectiveness. Prior to presenting the lesson plan to their peers, therefore, they must provide a rationale for the technology they choose. In short, they must explain how learning would be enhanced or improved by the technology intervention over traditional or non-technological methods.

Lesson plans are evaluated using a variety of design criteria including: the objectives, the technology, and the assessment of the objectives. We focus on how technology intervention enhanced the learning objectives. We ask students to explain how the lesson could be taught without the use of technology and to compare instruction. This is a way of overseeing that there is not a misuse or unnecessary use of the instructional technologies. To illustrate, one student created a series of grammar exercises with sound and pictures in a game format. She called her CD – *Grammar Safari*. Essentially, her use of technology provided a series of challenging questions used for bonus points. Another student introduced *The Canterbury Tales* by using PowerPoint slides to explain Middle English and medieval writing. She also added an Internet URL that connects students to a site where excerpts from *The Canterbury Tales* is read aloud. Other preservice teachers created threaded discussions on the Internet on various literary topics, while others led research groups to discover historical backgrounds and related literature and still others created CD packages for collaborative learning exercises. The importance of this preservice lesson presentation design is to encourage teachers to make choices about the selection of technologies to have a more positive influence on student learning.

## Evaluation and Recommendations for the RMC Program

After the first few sessions of the technology component, our preservice teachers showed a high degree of mastery in the use of instructional technologies. Our goal to have our preservice teachers demonstrate their knowledge of integrating technology as an instructional tool by crafting a lesson where a specific technology is linked to a method, to meet the lesson objectives was met. The challenge for our preservice teachers was understanding the use of the instructional technologies more from the standpoint of motivation or as means of providing variety to lesson planning.

The decision to incorporate this technology component during the four week block, proved to emphasize technology as another strategy teachers had to improving instruction, rather than as an "add on" to a lesson for the purpose of fulfilling a district or school requirement to use technology in some way in the classroom. Our preservice teachers were able to effectively evaluate the use of technology as an instructional tool in this setting.

The fact that our preservice teachers are successful in evaluating technology as an instructional strategy is encouraging. We realize, however, that the setting (a university classroom filled with friendly peers and helpful instructors) is not the real world. We recommend that as a next step, our preservice teachers plan, teach, and evaluate lessons using technology as a tool for learning in their classrooms during student teaching. We also recommend that these preservice teachers teach technology lessons as they are being evaluated by university supervisors who have been trained in the ASSURE model. Further, we recommend that our preservice teachers teach the same lesson to two groups of students—once without the use of technology and later with technology, measure student learning, and then evaluate the use of technology as an instructional tool. In these ways, we hope to encourage our preservice teachers to continue to evaluate carefully their choice of technology and to provide additional date an the effectiveness of technology as an instructional tool in public school classrooms.

The infusion of technology as a positive intervention for student learning requires training in how to *best* use these technologies to meet the learning objectives. The research has attempted to clearly demonstrate the positive results of technology intervention, but given the number of variables associated with the teaching/learning process, it is difficult at best to show definitive results. Many researchers are continuing to explore this technology intervention, and perhaps in the future there will be studies that may bring conclusive evidence to the forefront. One researcher, R. Kozma (1991, 1994) offered an interesting and functional interpretation in referring to technology not as a medium to deliver information per se, but rather as a device to connect the learner with that medium to construct knowledge. It may also be the efforts of the preservice teachers at Robert Morris University and other colleges and universities that will help provide the necessary research answers to the use of instructional technologies as positive interventions for student learning in the classroom.

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# Preservice Teachers Integrating Technology: An Update

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**Abstract:** Elementary teachers often are required to integrate technology in their classrooms and to teach students to utilize technology. In Pennsylvania, preservice elementary teachers typically receive one course in technology instruction. Giving preservice elementary teachers the training and experiences they need to make valid decisions in the use of technology, as a tool for instruction is required of preparing institutions. In the program described previously, our goals were (1) to have preservice teachers mastered the use of technology for their personal needs, (2) to evaluate software packages, and (3) to create lesson plans that integrate technology in appropriate ways. The following discusses the program and provides an update on the changes and revisions we have made during the first two years of the RMU elementary certification program.

## Introduction

Today, elementary teachers often are required to integrate technology in their public school classrooms. At best, most of these teachers believe that integrating technology means teaching their students how to use equipment or software. At worst, many teachers use technology in their classrooms as an add-on to satisfy requirements for their evaluations or to meet the demands of administrators. In Pennsylvania, preservice elementary teachers typically receive only one course in technology instruction. There is little or no attempt to demonstrate ways to integrate technology into their future classroom assignments in education or methods courses. It is important to give preservice teachers the training and experiences they need to make valid decisions in the use of technology as a tool for instruction. In the RMU elementary education program described at SITE in 2000, preservice teachers first were to master the use of technology for their personal needs (Lund & Runyon, 2000). Second, preservice teachers were to be taught ways to evaluate software packages. Next, our preservice teachers were to have opportunities to create lesson plans that integrated technology in appropriate ways. Finally, preservice teachers were to use technology in actual classroom situations with small groups of elementary students. Now in its third year, the elementary education program at Robert Morris University is being evaluated for its effectiveness in meeting the goals and objectives of the program.

As we began the evaluation process, we first turned to the research on teacher training and technology. We discovered that many researchers and experts agreed that it is important to continue to stress the importance of using technology as an instructional tool rather than as a "add-on" to instruction. Maeers et. al (2000) argue that preservice teachers need opportunities to learn and use technology and to have instructors model technology as an instructional tool. We have found that the more comfortable and familiar our preservice teachers are with instructional technology the more likely they are to use it and, more importantly, the more likely they are to integrate technology for personal uses.

### The Program: A Review

Given the opportunity by the Pennsylvania State Department of Education to develop a new elementary education degree program with a focus on integration of technology, Robert Morris University (RMU) responded by incorporating technology throughout the program—specifically in all education and methods courses as reflected in department syllabi. The integration of technology in course assignments illustrates to preservice teachers in a concrete manner ways in which technology can and should be used by educators as a tool instead of a "by-product." Some examples of learning activities in various courses include:

- searching for appropriate Internet sites and creating hyperlinks for elementary students.
- corresponding via e-mail to elementary students.

- evaluating software packages in content areas such as interactive reading software for reading and language arts methods.
- creating graphic organizers and data bases, using commercially packaged software such as PowerPoint™ and Claris Works for Teachers™
- evaluating on-line lesson plans and teacher materials
- using scanners to integrate pictures of students' work into text and presentations
- evaluating video segments for use in the classroom.

Through these courses and activities, preservice teachers learn that technology is a natural extension of their lessons and can be incorporated in the classroom as a tool for learning. They learn when the use of technology is inappropriate as well as when its use can enhance instruction.

At RMU preservice elementary education majors are required to take 15 credits of technology courses: nine from the college technology core and six from the RMU core. With this background, students are prepared to effectively use technology to teach content in specific subject areas. These technology core requirements are not intended to make technology experts of elementary majors: rather, the goal is to produce competent, confident elementary teachers who are comfortable with the use of technology as a tool when implementing successful teaching strategies. To accomplish this goal, RMU faculty used the National Education Technology Standards published by the International Society for Technology in Education as a model for designing courses and assignments.

**The Program: an Update**

Elementary preservice teachers in the Robert Morris University elementary education program have used technology as a tool for their own learning in many of the institution's core courses that they have taken. Specifically, they have been required to use word processing software in their Communication Skills I and II courses, and to incorporate graphics, tables, and charts into these documents. They have had some experiences with Internet research and have used technology to help in preparing presentations especially in Communication Skill III-V. More importantly, instructors have modeled the use of technology as an instructional tool. Our preservice teachers have finished two "stand alone" technology course (Tech Literacy for Educators I & II) that focus on configuring hardware to meet the specific needs of their future classrooms. Preservice teachers learned, for example, how to set up equipment, cable scanners, printers, monitors, and document cameras together. They learned how to use digital cameras and video cameras. They also learned how to cable VCR and DVA players to other equipment. Our intent was not to make technology "gurus" out of our preservice teachers, but to give them the information and skill they would need to perform basic maintenance and trouble shooting on the types of equipment they find in their classrooms. In this way, we hoped to give our elementary preservice teachers the ability to lessen instructional "down-time" waiting for the technology specialist or support staff. We do realize that most public school classrooms will not be equipped with the amount of technology that we require of our elementary preservice teachers, but we feel that it is important for our preservice teachers to become familiar and comfortable with a variety of technologies.

As our first group of elementary preservice teachers completed Tech Literacy for Educators, we began evaluating ways in which we could improve and expand technology literacy. Our elementary preservice teachers were extremely helpful in voicing their views about the course and the ways they thought it might be improved. With the help of our preservice teachers, we have begun the process of reorganizing and restructuring the course to better meet their needs.

In addition to the technology courses, our preservice teachers have completed Developmental Literacy and Children's Literature. Both of these courses require our preservice teachers to utilize the information they received in their technology course and to integrate technology into these areas. Preservice teachers in Children's Literature, for example, have created spreadsheets, graphic organizers, and charts using the computer and appropriate software. They have begun work on a database for teacher recourses and a course web page that will continue to be updated each semester.

The technology requirements for our preservice teachers has meant that instructors in these courses have had to reevaluate their own teaching, assignments, and requirements to provide preservice teachers the opportunities they need to understand the use of technology as a learning tool. As Basinger (1999) argues, institutions that reported the highest levels of student technology skills and experiences were ones that did not demand several stand alone technology courses, but those hat integrated technology throughout the teacher training program.

As RMU began to design the elementary education program, the concerns about the demands placed on faculty were discussed and ways to resolve these concerns were explored. This demand on the RMU faculty has meant that seminars to disseminate information about the use of technology in curricula design, software availability, and hardware updates must convenient, appropriate, and timely. Faculty interaction must also take place to ensure that

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the necessary skills have been taught and that assignments build on one another instead of conflicting or overlapping. Since adjunct faculty who are full-time elementary classroom teachers teach many of our method courses, full-time RMU faculty must work with adjunct faculty to ensure that the level of technology integration modeling is maintained. This also means that RMU must remain committed to providing faculty development and resources.

Our preservice teachers have had to make adjustments as well. No longer is the course over at the end of the semester. The information they learn in one course has been integrated into another. In fact, this concept of demonstrating how information should be used from course to course has been working so well with the technology that we have begun to incorporate it in content courses. The work done in Children's Literature, for example, is expanded in Reading and Language Arts methods and used in Science, Social Studies, and Mathematics methods.

Currently, these preservice teachers are in their third year of the program and are enrolled in Educational Assessment. This course will require them to create ways to assess student learning. It will also require them to plan and evaluate the ways in which they organize and deliver instruction to their future students. The goal of this course is to help preservice teachers understand the ways in which technology might be used as an instructional tool to both aid student learning and to aid in student assessment.

## Future Plans

As our first class of elementary preservice teachers are finishing their course work, we are making plans to have our adjunct faculty (those elementary classroom teachers) come to the campus for training on the equipment our students have been using. We are also planning workshops for these teachers in the ways to integrate technology as an instructional tool for public school elementary students. We plan, for example, to have these adjunct faculty develop units in content areas that require their students to use the Internet, scanners, and document cameras. We also plan for these teachers to learn to use and teach PowerPoint in their classrooms. Adjunct faculty will be asked to bring an existing lesson plan and to integrate technology into that plan with the help and guidance of RMC full time faculty. Then, teachers will teach the plans with and without technology to groups of their students. RMC full time faculty will be available to assist the teachers in the classroom. Finally, these teachers will evaluate the effectiveness of technology as an instructional tool. We feel that it is important for our adjunct faculty to go through this process with us so that they can better evaluate our preservice teachers in their methods courses and during student teaching.

In addition, our future plans include a post baccalaureate program in elementary education and a masters program and exploring the possibility of a doctorate in elementary education or curriculum and instruction. Many of our current preservice teachers are expressing an interest in continuing their education at RMU. Several of our adjunct faculty and their colleagues have asked about the possibility of completing a doctorate at RMU.

## A Final Word

The use of technology in elementary preservice teacher programs requires a new mind set for instructors and elementary preservice teachers. Programs such as ours are beneficial only when elementary preservice teachers are given clear instructions, time to practice, and requirements to integrate technology throughout their program. This means that instructors must work closely together to ensure that technology requirements remain consistent and yet build toward helping elementary preservice teachers become familiar with the use of technology as a tool, not as an add on, and helping elementary preservice teachers distinguish when technology enhances rather than detracts from learning.

We had an advantage when we began our elementary education program; we had never had such a program at Robert Morris University. We, therefore, did not have to deconstruct traditional practices. We did not have the political or territorial conflicts that other institutions might encounter. We are able to experiment and change as we discover problems and solutions within our program. With the help of our elementary preservice teachers, we are continuing to refine and hone our program to meet their needs and the needs of public school children.

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# Shifting the Teacher and Student Roles in the Classroom Blending Web Design and Service Learning for Classroom Change

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Abstract: Students in the process of learning web design are often unable to experience the real-world design process that takes place between a client and the web designer. Interpersonal and group dynamic skills are essential in order for one to be successful in education and business. By linking Web design and service learning, students have an authentic experience to learn and apply these skills while designing web sites for their community. Community organizations are often without time or skill to build their Web sites and students can fill this need. To provide for these student experiences, two main changes need to occur in the classroom dynamic: a paradigm shift from teacher to facilitator and shift from student to team player.

Service learning provides students with skills for teamwork, individual responsibility, and accountability. These skills help students become productive members of their communities by forming a connection with local organizations and community members. Professional Web designers also rely on teamwork, individual responsibility and accountability when developing a Web site. Using Web design skills in service learning accomplishes two main goals. First there is an authentic, real audience and/or client for whom students can build Web sites. Second, students can apply the universal values and skills of service learning to provide them with an authentic Web development experience. Using Web design skills in service learning allows students to become active participants in their communities while applying knowledge and skills from the classroom. Students can make connections in the community, transfer community service concepts to Web design, and practice the professional skills of Web design. To support this type of work, teachers need to be prepared to shift their roles in the classroom and provide students with experiences that will promote teamwork.

## Shifting the Teacher Role

Service learning requires building ties in the community. To promote the authentic experience of working with actual organizations, teachers need to expand their classroom roles to build relationships outside the classroom. This action causes teachers to move towards a facilitator role as they forge relationships and set up explicit expectations between the classroom and community organizations. The facilitator role becomes important in preserving outside relationships with the classroom and helps to model professional Web design and development practice when the project begins. The teacher can maintain instructing and helping students accomplish Web development work for the community. A successful example of this type of work is the Hands on the Land project conducted through the Wilderness Technology Alliance (WTA). This project links classrooms with federal lands. Teachers, with the help of the WTA plan the visitation and exploration of the site, build the expectation and relationship, and coordinate student Web site production. This method helps the teacher transition towards the facilitator role.

## Shifting the Student Role

Professional Web design requires team participation. To successfully model and engage students into the professional team process, teachers must help student understand the dynamics of team interaction. A possible method to help students understand the importance of teamwork would be to engage students in other activities that involve teamwork. For example, the Wilderness Technology Alliance (WTA) has created a model for teaching students about teamwork and the important skills that team building provides. During a two-week summer camp teachers will take students on a weeklong hike to collect data on Mt. Rainier and then these student groups will apply their team building skills to creating a Web site to represent the data they collected. These team skills will help students model professional practice and ease their transition into group work for outside clients. Teachers create links between professional practice, classroom practice, and a familiar environment for teamwork such as the wilderness.

## Conclusion

When teaching Web design, teachers will need to shift the roles in the classroom to provide an authentic learning experience. As the facilitator of the classroom, teachers will build their role by creating ties in the community and helping students model professional behavior. As exampled by the WTA and it projects, there is much success that stems from building partnerships and helping students learn to be better team players.

# The pedagogical scenario: as a tool of professional development in the in-service teachers and pre-service teachers.

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**Abstract:** Within the framework of our research-action-training, we propose the interaction among the in-service teachers and pre-service teachers in professional development courses for the conception and implementation of a pedagogical scenario to integrate ITC into the classroom.
As a consequence, both in the creation and implementation of the scenario, our aim is to allow in-service teachers and pre-service teachers in professional development to go through a socio-constructivist learning experience which is to the same extent a sharing experience in a practical learning community that will provide a new belief concerning the development and use of pedagogical scenarios.

## Introduction

The Internet contains a growing number of resource sites containing pedagogical strategies and practices linked to various educational content. These sites contain suggestions for lesson planning procedures, integrating TIC, and at times, various other tools which may enable their application in the classroom.

These procedures are meant to guide the teacher in planning the learning process, while taking into account the different variables such as teaching tools, participants, context, as well as the question of who may contribute or thwart the learning process. The result of this planning is called the pedagogical scenario or lesson plan. The majority of these scenarios, which are available in the database and on the Web, have been devised by students of education as part of their coursework.

## The Study

Within the framework of our research-action-training, we propose the interaction among the in-service teachers and pre-service teachers in professional development courses for the conception and implementation of a pedagogical scenario to integrate ITC into the classroom. This training takes place within a course conceived as a professional training laboratory, at the University of Montreal.

In this course the learning and teaching socio-constructivist dimensions such as collaborative learning, student centered learning, stimulation leading to learning autonomy in a meaningful and realistic context (Viens, 2000) are taken into account. Thus, the in-service teachers and the pre-service teachers are invited: to participate in pedagogical and technical training workshops; to group up in working teams made up of one in-service teacher and three pre-service teachers; to hold individualized meetings with the tutor as a group; to take part in the discussions forum; finally, to contribute to *Les Scenaristes* site in the creation of the pedagogical scenario for ITC integration. In this way, in-service teachers and pre-service teachers become members of the same working team.

In order to construct a lesson plan, *Les Scenaristes* site proposes a systematic procedure in five phases:situation analysis, lesson plan design, pedagogical material production, lesson plan application, and finally, the evaluation and revision of lesson plans and pedagogical material.

The pedagogical procedure of the lesson plan design contains five elements: situation, learning situation, objectification situation, evaluation situation and transfer *(réinvestissement)*. These are presented as the basic elements of a lesson plan, which must be combined and orchestrated according to the needs of the students in question, as well as the peculiarities of the learning context

While in traditional practice, the conception of a pedagogical scenario is considered an instrument for teaching planning; we see it, from a socio-constructivist perspective, as a tool which leads, in the first place, to reflection before, in and after action; *adding* they fix an interpretation and a solution, but are open-ended and easily revised; they take account the external factors and they use them in order to consolidate the learning experience (Carrol, 2000), and above all, it is an instrument to share experiences and practices.

However, in the first steps of our research, we noticed that in order to conceive a pedagogical scenario from this new paradigm, there are barriers to be overcome, such as the association of the scenario to a traditional pedagogical planning, closely related to objective cognitivism, beliefs related to its use as well as models and recipes which provide an anticipative vision of reality. These beliefs appear already at the beginning of our research and they oppose to the socio-constructivist dimension we wish to follow in both its conception and implementation.

As the activities develop, the groups are led, by the tutor, to reflect on the roles of each of the actors of the scenario: teachers and students, as well as on the importance of providing the models of the necessary tools for the support of learning in a socio-constructivist context, such as the suggestions for the implementation of evaluation tools and the strategies and questions of objectification. We hope that the teacher will venture beyond pedagogical planning in order to implement a new approach set out by the education reform.

Bearing in mind that the research is still in the data collection phase, it seems to be too early to make conclusions. Nevertheless, we can state that that there is a growing interest in this problematic on the part of the teachers dealing with evaluation tools in education, as well as on the part of the students engaged in coursework projects. Consequently, we need to reflect on the priority level which the elaboration of these tools might occupy in the process of lesson planning, as well as on the importance it might have in supporting the teacher in the milieu of a new pedagogical practice.

Nevertheless, we believe that an essential advantage of the scenario is misunderstood: its role as a tool to share pedagogical practice and tools for this practice.

Therefore, both in the creation and implementation of the scenario, our aim is to allow in-service teachers and pre-service teachers in professional development to go through a socio-constructivist learning experience which is to the same extent a sharing experience in a practical learning community that will provide a new belief concerning the development and use of pedagogical scenarios.

## Conclusions

We believe that the study of this educational device will enable us to know more about the priorities set out by teachers in connection with their training in TIC. We also believe it is possible to observe the position which planning, elaboration, and lesson plan tools have in the formation of a new pedagogical practice, using TIC in order to support it.

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# Developing Appropriate ICT Competencies in Trainee Teachers: An Australian Example.

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**Abstract:** This presentation will explore the rationale for, the strategies used, and the initial implementation successes and failures as minimum ICT competencies were determined at a regional Australian university for each year of the four year, double degree teacher training programs. Catering for the diverse ICT needs of nearly 2000 early childhood, elementary and high school teacher trainees necessitated changes in program structure, modification of existing courses, creation of new course components, changes in assessment requirements, establishment of additional infrastructure, and training of staff. Issues such as staff involvement in the decision making processes, determining entry ICT competencies of entry level students, providing for ICT skill development, assessing ICT milestones and future challenges, will be explored.

## Introduction

Although Information and Communications Technologies (ICT) have been used in some aspects of undergraduate teacher training programs for many years in Australian universities, it is only in the last few years that any systematic attempt has been made to identify and clarify expectations of minimum ICT competency standards for all graduates from teacher preparation programs.

This presentation will explore the rationale for, the strategies used and the initial implementation successes and failures as one regional Australian university determined minimum ICT competencies for each year of its four year, double degree teacher training programs. Catering for the diverse ICT needs of nearly 2000 early childhood, elementary and high school teacher trainees necessitated changes in program structure, modification of existing courses, creation of new course components, changes in assessment requirements, establishment of additional infrastructure, and training of staff.

In 1998, the NSW Department of Education and Training (New South Wales is the most populated state of Australia), the major employer of graduates from university Faculties of Education, expressed concern that the minimum ICT competencies of many graduates from NSW universities did not meet the needs of the schools and that appropriate demonstration of ICT minimum competencies would be expected prior to an offer of employment. Although a report on "Preparing a Profession – Report on the National Standards and Guidelines for Initial Teacher Education Project (Australian Council of Deans of Education, 1998)" had identified 14 graduate attributes deemed as necessary for effective beginning teachers, including use of appropriate technologies, particularly information technologies to facilitate learning, for administrative purposes and for professional interaction, many Faculties of Education had only paid lip service to ensuring that these attributes were appropriately developed in all programs. The threat of the major employer for the state to refuse to offer teaching positions to graduates who did not meet minimum ICT competency levels focused attention on program redesign and changes in assessment processes!

## Determining basic ICT competencies

Using a report "Computer Proficiency for Teachers", prepared for the Ministerial Advisory Council for the Quality of Teaching in 1997 (see http://www.det.nsw.edu.au/macqt/comppro.htm), the Faculty of Education at the University of Newcastle, Australia, redesigned programs and assessment requirements in an attempt to include the basic competencies identified as critical to beginning to teach in NSW schools. The report recommended that all graduates of initial teacher education courses should have as a minimum proficiency, ICT skills in the areas including:

- Basic operational skills including understanding the various components of the computer, using a variety of software applications such as word processing, database and spreadsheet functions, information retrieval, use of graphics, simple desktop publishing and use of drill and practice activities.
- Information technology skills including the ability to find information, select appropriate applications and software for the classroom, organise material sequentially, assess the relevance of information and present it appropriately.
- Software evaluation skills such as the ability to determine underlying pedagogical assumptions, gender and ethnic bias, educational relevance and suitability for the classroom.
- Pedagogical skills for classroom management such as the ability to create student centred learning environments, to develop innovative ways of using technology to enhance the learning environment and to encourage students' creativity andresearch.
- Awareness of values and ethics related to the social and educational use of computers and associated software and applications

The report highlighted that the major challenge to be faced in the integration of technology in the classroom would be the pedagogical implications, the impact on the structure and content of curriculum, classroom organization and practices and the changed role of the teacher.. Moreover, the report argued that the key issue is pedagogical rather than technical, that teachers need to come to terms with the pedagogical challenges posed by effective classroom use of ICT (p.5).

### Implementing a basic ICT skills approach

The first steps to implement these recommendations were taken in 1999 by a part time lecturer who developed a matrix to map where these skills were dealt with across all existing teacher education programs provided by the Faculty of Education in Early Childhood, Elementary and High School specializations. These matrices demonstrated that few ICT skills were covered within courses and that there was a completely ad hoc approach to development of ICT skills across all teacher education programs. To ensure that basic ICT skills were required of all teacher education students, a series of tutorial sessions were established in the first year core course on learning processes which was taken by all beginning students. However, the range of ICT skills of the tutors presenting these sessions was so variable that the decision was made to supplement these computer lab based sessions with workshops for those students who needed additional help. A part time lecturer presented these workshops and devised a self help manual to cover basic skills of word processing, presentation, email use, web page construction, spreadsheet use and software evaluation. At the university level, infrastructure was set up to provide every student with a free, Internet based 'Studentmail' email address and self-instructional software was evaluated and purchased so that all students could access online tutorials to learn basic and advanced use of a wide range of software applications.

The poster session will present data collected from all first year student teachers at the end of the first semester 2000 and 2001 which shows that there was a significant increase in student use of and perceived competency in a range of software applications but that there were still a surprisingly high proportion of first year university students who claimed only occasional use or no use of some software applications. Samples of scenarios used to develop basic ICT competencies and presented in tutorials will be shown. Positive and negative experiences in using an online tutorial system "Skillbuilder" will be outlined. The current assessment criteria for development of "Computer Competency Milestones" in MS Word, Powerpoint and Excel will be shown. Issues in convincing academic staff to embed ICT competencies in their course assessment will be explored and challenges in developing academic staff understanding of wider applications of ICT in all aspects of student teacher learning will be outlined.

# Creating a Technology Competency Agreement between Colleges

Kathleen M. Sindt

The teacher education program at Montana State University - Billings (MSU-Billings) is in a unique situation in the types of students it receives. Approximately 40% of the student population in the teacher preparation program are transfer students from the community colleges in the region. We have formalized partnership agreements with many of these colleges.

The partnerships formed with the neighboring community colleges allow students who have completed an Associate's Degree to use this degree to show completion of the General Education requirements. Most of these students are ready to be formally admitted to the teacher preparation program.

One of the requirements to entry into the teacher education program is a basic computer competency. This competency can currently be met by either taking an introductory Educational Technology class, or by showing mastery of the skills taught in the introductory class.

The problem that has been occurring is that many of the students transferring from the partner schools have not been provided with an opportunity to meet the competencies prior to arrival at MSU-Billings. This puts them behind their colleagues who have had the chance to earn these competencies early in their college experience.

As part of the PT3 grant, the MSU-Billings educational technology faculty are working with faculty from the partnership schools to develop a plan to ensure that all students have the same competencies prior to applying to the teacher education program at MSU-Billings. The plan will include an agreement between faculty from the different institutions about what competencies need to be met by the students from the partner schools, and a plan for each institution, including MSU-Billings to institute policies to ensure these competencies are met. It will be up to each individual institution to determine the means by which the competencies are met by the students.

As competencies change, the faculties will need to continue to meet to update the competencies. Eventually, it is hoped that this process will be formalized and agreed upon by the administrations of the various institutions involved.

This presentation will discuss the process being used to reach an agreement between the partner institutions. It will include a discussion of the steps taken along the way by the various partners and the steps that need to be taken to formalize the agreement.

## Meeting the Educational Technology Standards for Teachers: Measuring One College of Education and Human Services

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### Introduction

In the fall of 1999, the college moved into a newly renovated and expanded facility. This facility has state of the art technology in each of the new classroom, including a digital projector connected to a DVD player, a VCR, an electronic overhead (ELMO) and an instructor's computer station. In addition, several new computer classrooms were added, as well as a set of wireless laptops.

As a part of a college wide effort to evaluate and improve the teacher education program, the College of Education and Human Services (CEHS) faculty wanted to know how well we are using the technology found in the new building to prepare our students to use technology in their classrooms upon completion of our program. The guidelines for judging the technology integration abilities of our students are the National Educational Technology Standards for Teachers (NETS•T) (International Society for Technology in Eductation, 2000). This paper discusses what activities the faculty members are doing to help prepare their students to be technology -using teachers.

### Instrumentation

A survey instrument was created to evaluate how well the faculty was preparing the student population to meet the technology standards (See Appendix). The survey listed each component of the NETS•T and each faculty member was asked to check which of the standards they were addressing in each of their classes. The survey was designed to allow quick responses by the faculty. Once the results of the survey were received, each faculty member who indicated they were addressing the standards was sent a follow-up. The faculty was asked to describe the activities that they had the students engaging in that addressed the standards they had checked on the survey.

### Results

Approximately eighty percent of the faculty (28 out of 35) faculty members completed the survey. Most of the faculty who did not respond are graduate faculty and do not teach students in the teacher preparation program. Of the faculty members who responded to the survey, only three of the faculty indicated they did not address any of the technology standards in their classes. The rest of the faculty indicated that they addressed at least one of the standards in their classes.

Of the faculty members who address the NETS•T in their classes, there are some differences in how many and what types of standards were addressed. The faculty who teach the general preparation level education courses that are required prior to admittance to the teacher education program use less technology in their classes than those faculty who teach the professional preparation classes (teaching methodology classes).

The general preparation faculty concentrate on aspects of Standards I: "Technology Operations and Concepts", II: "Planning and Designing Learning Environments and Experiences, and V: "Productivity and Professional Practice" of the NETS•T (International Society for Technology in Eductation, 2000). The aspects of the standards addressed in the foundational classes ensure that students can use technology to help with their own learning. These faculty members expect their students to be able to use and evaluate technology resources, to use technology in their own learning, and to apply technology to increase their productivity. The activities that these faculty have their student engage in center around using the Internet for research and in creating PowerPoint (Microsoft PowerPoint, 2001). presentations based on their research.

Prior to admittance to the teacher education program, students are encouraged to take the Educational Technology course. While this is not officially a requirement, the faculty of the teacher preparation courses expect their students to be proficient in technology prior to enrollment in these classes. The Educational Technology course concentrates on Standard 1: Technology Operations and Concepts, Standard V: Productivity and Professional Practice, and Standard 6: Social, Ethical, Legal, and Human Issues (International Society for Technology in Eductation, 2000). This course teaches students how to use several tools, including word processors, spreadsheets, databases, and a multimedia development too. In addition the students are expected to learn how to use the Internet effectively, know how to send and receive email and how to use peripheral devises, such as scanners, digital cameras, and printers. In addition, students participate in discussions related to copyright, equity, and diversity issues that are related to technology.

The faculty that teach the courses for professional preparation build on using the tools learned in the Educational Technology tend to concentrate more on Standards II: "Planning and Designing Learning Environments and Experiences", and Standard III: "Teaching Learning and the Curriculum" of the NETS•T (International Society for Technology in Eductation, 2000). In addition to and the students activities described above. In addition to the types of activities described above, these faculty members expect their students to create more extensive projects. For example, in Science Methods, students are exposed to several projects that involve technology, look at lesson plans that include technology and are that can be used with students. In Math Methods, students are required to teach their peers how to use various mathematics software programs, such as Tessellation Exploration (Lee, K, 2001) and Microsoft Excel (Microsoft Excel, 2001). They are also expected to incorporate technology into the required unit plan for the course. In Social Studies Methods, all students are expected to conduct research on a country. Part of the research includes finding web sites related to the country they are assigned. They are then expected to create a multimedia presentation using HyperStudio (HyperStudio, 1999) that incorporate graphics, sounds and the web sites that they found. In other courses, students evaluate software, and explore issues related to special education.

## Conclusions

Based on the results of the surveys and follow-up responses, it appears that the faculty in CEHS are doing a good job of addressing many of the NETS•T. However, there are some gaps in where the standards are addressed and in which standards are addressed. Currently, Standard IV: Assessment and Evaluation, is only addressed a couple of times, and not in great detail anywhere in the curriculum. It appears that this is an item that needs to be included into the curriculum at some point.

Also, while most of the standards are addressed at the teacher preparation level, there is little carry over into the field experiences of the students. Students are expected to create a technology rich lesson for their introductory field experience seminar, but are not required to use this unit with children. Students are not required to use technology in their student teaching experiences at this time. This is an issue that will need to be addressed in the near future.

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# Multi Media Meets Multiple Intelligences: Training Teachers for the New Century

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## Introduction

The National Educational Technology Standards (NETS) Project, a program that concentrates on preservice teacher education as a division of the International Society for Technology in Education (ISTE), has defined specific concepts, knowledge, and skills considered essential in order to apply technology in educational settings. Preservice teachers participating in their preparation programs are expected to demonstrate competency in Technology Operations and Concepts. Requisite proficiencies range from using technology tools and information resources to increase productivity, promote creativity, and facilitate academic learning to examining acceptable use policies for the employment of technology in schools, including strategies for addressing threats to security of technology systems, data, and information. The availability of diverse multi-media based technology in the academic arena promotes a re-evaluation of traditional methodological strategies to now include concepts that promote the recognition of various categories of potential intelligences.

The theory of multiple intelligences was developed in 1983 by Howard Gardner, Hobbs Professor of Cognition and Education at the Harvard Graduate School of Education. Multiple intelligences theory holds that each person has abilities of varying degrees in several different and discrete areas. This is in contradistinction to general theories of intelligence that have been advocated during the past century. The theory promoted by Gardner in his 1983 book, *Frames of Mind*, claims that each individual has capabilities or potentialities in seven distinct areas: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. Another area of intelligence according to Gardner in his 1993 book, *Multiple Intelligences: The Theory in Practice*, is designated the naturalist. Further possible areas of intelligence - spiritual, existential, and moral - are explored by Gardner in his 1999 book, *Intelligence Reframed*; however, after extensive discussion, Gardner (1999) has decided not to add them to the current framework. The key to understanding the theory of multiple intelligences is to recognize that each person has strengths and weaknesses in each of these areas, as well as a uniquely individual combination of abilities acquired from all intelligences. These intelligences are dynamic in nature rather than static, that is, they are capable of changing over time. This paper will explore the eight multiple intelligences that currently compose Gardner's theory and examine their relationship to educational technology.

## Multi-Media Technology Meets Multiple Intelligences

The current culture of multi-media technology allows for many interactions between technology and multiple intelligences. Jonassen (2000) advocates the use of computers to support meaningful learning through cognitive tools. These "mindtools" are computer applications that require students to think in meaningful ways or produce actual representations of what they know through critical thinking.

Roblyer and Edwards (2000) state, "Gardner's theory meshes well with the trend toward using technology to support group work. When educators assign students to groups to develop a multimedia product, they can assign students roles based on their type of intelligence. For example, those with high interpersonal intelligence may be the project coordinators, those with high logical-mathematical ability may be responsible for structure and links, and those with spatial ability may be responsible for graphics and aesthetics" (p. 66).

Multi-media technology, in particular, is a remarkable vehicle for allowing the expression of multiple intelligences. Armstrong (1994) correctly ascribes the potential applications of the multiple intelligences theory with computer technology. The list of software recommended to activate multiple intelligences can serve as a template for the exponentially expanding varieties of software available to educators. With the rapid increase of software, both in sheer volume as well as complexity, applicable to each of the eight areas of multiple intelligences, there seems to be no limit to the integration possibilities of multi-media technology and multiple intelligences.

## Drury University and Multi-Media Efforts in Teacher Preparation

The renowned Drury University teacher education program requires students to complete five foundation courses, including Technology in the Classroom, EDUC 200. This is a three-hour introductory course enabling participants to explore a number of technologies that can be used in the classroom. The course focuses on three areas: how to operate the technologies, how to use the technologies to enhance personal productivity, and how to use technologies in a learning/instructional environment.

Multi-media and multiple intelligences coordinate to create opportunities for both individual as well as group learning. In the case of the Drury University teacher preparation program, multimedia applications are stressed at both levels -personal and group. This allows for a synergistic confluence of multiple intelligences. On the one hand, individuals will draw upon their strengths in each of the eight intelligences to create a product. Conversely, a group project is enhanced due to each individual bringing into the mix a unique blend of intelligences that interact with the intelligences of the other group members. The result is the same, the whole is greater than the sum of the parts.

## Specific Utilization of Multiple Intelligences through Multi-Media

Linguistic: Each of the course projects requires the students to use written and oral language skills. The Microsoft Power Point presentations contain text and Microsoft Word documents are required in the lesson plan presentation and the final project. The projects require the students to make oral presentations.

Musical: Each project allows the student to utilize musical selections to augment moods and experiences. In the lesson plan presentation and final project students may choose musical topics for their themes.

Logical-mathematical: The capacity to analyze problems logically is required in all of the assigned projects. Students may also choose mathematics for their theme in the lesson plan presentation and the final project

Spatial: Each of the projects features a need to recognize and manipulate patterns. To create multi-media presentations using the Microsoft Power Point software, students must be able to discriminate spatially and to integrate colors, graphics, and texts in a balanced format.

Bodily-kinesthetic: This intelligence is not just limited to sports or athletic activities, but it also includes the use of the individual body or parts of a body to fashion products. The field of multi-media presentations requires the use of the hands to create the text documents and the Microsoft Power Point presentations. Students must also demonstrate physical coordination to present their slide shows while delivering their oral presentations.

Interpersonal: This intelligence is utilized primarily through the presentation of finished products. It is used to the greatest extent during the group review process for the final project.

Intrapersonal: This intelligence is employed during each of the required projects for as students utilize the capacity for self-understanding, including personal desires, fears, and aptitude.

Naturalist: Students who select a science theme for their lesson plan presentations or the final project could be expressing and utilizing the naturalist intelligence.

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# Preparing Teacher Educators to Use Technology: Applications and Perceptions of Technology Integration

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**Abstract**: The purpose of this paper is to describe a work in progress that reveals teacher educators' perceptions and applications of technology integration in the methods courses they teach. Data sources comprise of survey results and semi-structured interviews. The International Society for Technology in Education/National Council for Accreditation of Teacher Education (ISTE/NCATE) standards served as a model for the development of the online survey and interview questions. The Educational Technology Teacher Educator Survey (ETTES) was developed to measure technology integration skills, applications, and perceptions of teacher educators. Online survey administration and the interviewing process will be discussed.

## Background

Teacher educators rarely utilize technology in their own research and teaching, therefore the realization of the demands on K-12 teachers to integrate technology into the classrooms does not exist (National Council for the Accreditation of Teacher Education [NCATE], 1997). It appears that teacher educators do not know the potential involved with integrating technology into the classroom therefore they basically use technology for administrative purposes (Wetzel, 1993).

Research suggests that the traditional teacher preparation programs are not up to par in the field of integrating technology (National Center for Education Statistics [NCES], 2000). In order to effectively integrate technology in methods courses, collaborative efforts should be maintained between the methods and educational technology faculty to develop technology appropriate activities (Brush, Igoe, Brinkerhoff, Glazewski, Ku, and Smith, 2001).

### Purpose

This research effort is an attempt to identify the perceptions of teacher educators and effective applications that are implemented in the methods courses they teach. The study will identify the goals and objectives of teacher educators relating to their individual technology experiences to find out what technology activities and support will assist them in preparing future teachers. Teacher educators are the missing link to prepare future teachers to teach in the technological age. Teacher educators who are prepared and obtain a high level of confidence with integrating technology can successfully restructure the teacher preparation process.

This study investigates initiatives that assist teacher educators to integrate technology into the methods courses they teach. This study will answer the following questions:

1. Is there a significant difference between subject area and perceptions of technology integration?
2. What are the perceptions of teacher educators of technology integration in the subject area they teach?

**The Survey**

The ETTES is divided into four sections: (1) Technology Skills and Experiences, (2) Application of Technology in Instruction, (3) Perceptions of Technology Integration, and (4) Demographic Information. The first part of the survey, questions 1-8, ask participants to select what best describes their technology skills and experiences by answering if they can do a certain task with responses (1 = I can do this independently, 2 = I can do this with minimal assistance, 3 = I can do this with much assistance, 4 = I can not do this). Part II of the survey, questions 9-18, asks participants to select the number that best describes how often they apply technology integration skills during instruction (1 = Often, 2 = Occasionally, 3 = Rare ly, 4 = Never). Part III of the survey, questions 19-28, asks participants to select the number that best describes how strongly they feel about perceptions of technology integration (1 = Strongly Agree, 2 = Agree, 3 = Disagree, 4 = Strongly Disagree).

The finial section, section IV, asks participants for demographic information. The questions ask about employment location, methods courses they taught, years of teaching, employment status, level of education, computer usage, technology training, knowledge of technology, age, and gender.

**Interview questions**

The semi -structured interviews with teacher educators lasted approximately 35 to 45 minutes. The interviews focused on three areas as outlined in the survey: technology skills and experiences, applications in instruction, and perceptions of technology integration. The first section of questions asks teacher educators to describe training experiences and technology support. The second section of questions solicits modeling techniques, technology requirements of students, communication and classroom equipment. The third section asks about barriers, recommended changes, and improving technology experiences for teacher educators.

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# Creating a Constructivist Classroom Using Technology: Preparing Preservice Teachers

One of the most effective ways to integrate technology into the teaching and learning process is to create a classroom environment based on constructivism, a theory that views learning as the product of experience and social interaction. Constructivist theorists contend that the learner is an active participant and builds knowledge based on individual experiences (Adams & Burns, 1999). The individual understands new experiences by relating them to prior experiences. Sense is made of the world by individuals synthesizing new experiences into what they have previously understood. According to K. Smith-Gratto (1995), if an individual's current experience doesn't make sense in relation to prior experiences, disequilibrium occurs within that individual. When disequilibrium occurs, the individual must readjust existing schemata or create new schemata in order to create meaning or understanding of the event that caused the disequilibrium (Smith-Gratto, 1995).

Creating meaning is at the very heart of constructivism. A constructivist-oriented approach is essential in a classroom if students are to develop problem solving and critical thinking skills and to apply, analyze, synthesize and evaluate knowledge, skills and attitudes (White, 1995). Constructivism can also provide a framework for using technology in productive, and interesting ways to support student learning. In a constructivist classroom, the learner is immersed in an environment that supports the way they learn. A constructivist learning environment encourages students to engage in the active process of creating, rather than acquiring knowledge.

In a constructivist classroom, technology can be used as a tool to help students gain a better understanding of their world by providing unique experiences and resources (Boethel & Dimock, 1999). When technology and constructivist ideas are combined, students become empowered and spend more time in active construction of knowledge. Technology provides resources for student use in problem-solving and reflection. Students using technology spend more time collaborating with other students and communicating with teachers when developing technology projects (Southwest Educational Development Laboratory, 1998).

According to C. White (1995), there are four major themes central to teacher education programs preparing preservice teachers for a constructivist classroom. These include modeling by both instructor and students, reflecting, involving the students actively, and developing a community of learners. The use of technology must also be the focus of teacher education programs integrating these four themes.

Research suggests that educational technology is most effective when used to enhance constructivist instructional strategies (Southwest Educational Development Laboratory, 1998). Using technology as a tool to enhance a constructivist environment should be integrated throughout teacher training programs. Preservice teachers must understand that technology supported learning environments provide a variety of computer-mediated communication methods to support conversation and collaboration in a constructivist classroom.

Reitz (1983) maintains that it is what teacher educators do, not what they say, that affects preservice teachers' learning. Therefore, in order to prepare preservice teachers to transform constructivist beliefs into instructional strategies, university faculty must themselves become what Connect University's Scott Noon calls a "Techno-Constructivist". These Techno-Constructivist are teachers who integrate technology into the curriculum so that it not only complements instruction but redefines it. These teachers have realized the full potential of technology to help children build on their own experiences, construct their own meanings, create products, and solve problems successfully (Education World, 2000).

The integration of technology is vital in teacher education programs preparing preservice teachers to teach in constructivist classrooms. The major components of modeling, reflecting, involving students actively, and developing a community of learners will be facilitated through the use of technology.

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# Learning and the Use of Technology in Preservice Teacher Education: The Primacy of Interaction

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**Abstract:** This short paper reports on two outcomes from an ongoing evaluation of the infusion of technology into a large, multi-section, undergraduate preservice teacher education course at The University of Memphis. The two outcomes address how the students' (N = 294) assessed their own learning and how the students' rated their instructors. With both outcomes, student-student and faculty-student interactions were the important variables.

Only through assessment can we begin to focus on what is actually being accomplished with the infusion of technology in higher education classrooms. The question of whether or not to infuse technology is no longer the important issue. It is mandatory. As Dolence and Norris (1995, p. 2) have aptly explained in their book, "Transforming Higher Education: A Vision for Learning in the 21st Century," society is undergoing a fundamental transformation from the Industrial Age to the Information Age and students simply must be prepared. This is especially the case for preservice teachers who will be expected to use technology in the classrooms of tomorrow yet who are graduating from teacher preparation programs feeling unprepared (Johnson-Gentile, Lonberger, Parana, & West, 2000).

The use of technology will not replace the need for instruction and instructors. Students crave personal interaction and guidance (Carr, 2000). After all, education is basically a human endeavor (Theobald, 1997). As the past president of EDUCOM Robert Heterich stated, classrooms are highly personal, human-mediated environments (Noble, 1997, p. 6).

The purpose of this paper is to address "what happens" as technology is infused in a large undergraduate education course (N = 294), taught in 11 sections by different faculty. The course is a human development course required of all preservice teachers. Prior to the 1999 fall semester, the course was a traditional lecture-based, teacher-centered course, low (no) tech and high touch as differentiated by Green (1999). Beginning with the 1999 fall semester, the use of technology was infused throughout the course and the course became more medium tech and high touch (Green, 1999).

The sample size for the first semester evaluation was 207 students (70% response rate), primarily sophomores and juniors. The gender composition was 33 men and 174 women. The racial/ethnic composition was: 71 African-American, 121 white, 1 Hispanic, 14 other. The context for data analysis was multiple regression. The variables for the study included the: amount and quality of student-to-student interaction; amount and quality of student/faculty interaction; overall experience using technology; number of times the instructor e-mailed the student during the semester; amount of time the instructor used the available technology in the class; general rating of the instructor; student interest in using the Internet for schoolwork; amount of time the student used technology during the semester for schoolwork; and amount of problems the student had in using technology.

The first analysis addressed how the students' assessed their own learning. The dependent variable was called LEARN and consisted of three questions which addressed the amount of student learning, their motivation to learn and their familiarity with computers (Cronbach alpha = .82). The regression was significant, $F(6,188) = 16.59$, $p < .001$ and the variables accounted for 35% of the variance in LEARN. The significant predictors of LEARN, as determined by the standardized beta weights, consisted of student/faculty interaction (b = .20, p = .009), student-to-student interaction (b = .293, p < .001), the general rating of their instructor (b = .159, p = .016), and student interest in using the Internet for schoolwork (b = .174, p = .015). What the first analysis indicates is that as the quantity and quality of both the student/faculty and student-to-student interaction increased, the students' assessment of their own learning (LEARN) increased. In turn, as the students' assessment of their own learning increased, so did the general rating of their instructor and the students' interest in using the Internet for schoolwork.

The second analysis addressed, the students' general ratings of their instructor. The dependent variable was called INSTRUCT and consisted of a single question rating their instructor. In this analysis, LEARN became part of the independent measures. The regression was significant, F(5,194) = 15.46, p < .001, and the variables accounted for 29% of the variance in INSTRUCT. The significant predictors of INSTRUCT, as determined by the standardized beta weights, consisted of the number of times the instructor e-mailed the students during the semester (b = .180, p = .015), and the amount of time the instructor used the available technology in the class (b = .220, p = .001). What the second analysis indicates is that as the number of times the instructor e-mailed the students during the semester increased and the amount of time the instructor used the available technology in the class increased, the students' assessment of them increased.

It is important to note that the variables used in the study accounted for a small amount of the total variance in either LEARN or INSTRUCT. Since there has been very little data reported in this area and we know that much goes into student learning as well as evaluation of instruction, it is hard to say whether or not the amount of variance accounted for is small or indeed quite large.

What does this study mean? First, the results indicate that students do draw a distinction between student-to-student interaction and student/faculty interaction. The two types of interaction are different and serve different purposes. Classroom research has generally focused on the importance of student-to-student interaction, the incorporation of cooperative/collaborative learning activities and addressing the different learning styles of students. While student/faculty interaction has been shown to be an important factor in retention, scant research has been done to address the interaction in terms of student learning.

Second, the results from this study indicate that student/faculty interaction is just as important a factor in student learning as student-to-student interaction. It is not enough to just create an on-line discussion group for students. Students need feedback and guidance from instructors. Student/faculty interaction has traditionally meant time spent on teacher-directed activities inside the classroom and to a lesser extent, due to its time consuming nature, outside the classroom. With the infusion of technology the distance between the student and the faculty member is lessened and the dividing line between inside and outside the classroom becomes blurred in a very short period of time. In fact, faculty who received higher evaluations e-mailed students more times and used the available technology more often in their class. In turn, by increasing the amount of interaction via technology, students' learning increased.

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# Using Web-Based Modules to Support an Introductory Computing Course for Preservice Teachers

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The utilization of online materials and/or online modules is being rapidly implemented in many higher education courses. With online modules students and instructors are not confined by the limits of scheduled face-to-face class time. Online modules can provide learners the opportunity to work at any time that fits into the individual's schedule and at there own pace. We decided to explore the potential of using online modules in our introductory computing course as a means for preparing prospective teachers to learn and teach with technology. This self-paced module is designed to help students understand the nature, purpose, and function of graphic organizers as a cognitive tool to represent information and support learning.

Preservice teachers at The University of Tennessee are required to take a semester long introductory computing course which covers topics ranging from word processing to Web page design. "Breadth" versus "depth" is a typical challenge for these types of introductory computing courses. Instructors struggle between (1) the need to cover a wide range of tools so students can begin to envision the possibilities of learning and teaching with technology, and (2) eliminating certain topics in order to focus on a smaller subset of skills and information in more detail. An ever-present challenge for course instructors is to provide students with optimal learning experiences, balancing acquisition and application of skills within a given, and often limited, period of time.

Due to there significant benefit as an educational tool, graphic organizers seemed to be an appropriate choice for our initial module. As part of the course, students learn how to use Inspiration, an electronic concept-mapping software application. Since time is limited, students are often introduced to basic graphic organizer formats (such as brainstorming webs and concept maps) and do not learn about other functions and formats that are available for representing information. Students may be unaware of the various types of graphic organizer formats such as Venn diagrams, Fish Bones, KWHL, T-charts, matrices, and cyclical diagrams.

However, students who participate in the online self-paced module are exposed to a wide variety of graphic organizers, their suggested uses, and their advantages. By asking students to complete a self-paced module, we believe that students will come to class with a broader understanding of graphic organizers and their educational applications. In a face-to-face class that follows, students can use software to create meaningful graphical organizers and apply the knowledge gained from the module.

Because of time constraints, we see the value of using online modules to prompt the thinking, learning, and reflecting process prior to formally introducing a topic in class. We believe this pre-exposure will facilitate more informed in-class discussions and a more complete understanding of the subject matter. However, as with all out of class assignments, it is essential that students are interested in completing the assignment. Therefore, our challenge has been to ensure that the modules we develop actively involve students in constructing their understanding of the topic as opposed to passively reading information from a computer screen.

To facilitate active student involvement, interactive components were developed within the online module using Flash software. This type of interaction allows students to view a "show me" sample on screen, followed by the opportunity to construct their own graphical organizer. In addition, students are provided with immediate feedback regarding their performance at frequent intervals throughout the simulation.

The online graphical organizer module will be pilot tested during the spring 2002 semester. Preservice teachers enrolled in the introduction to instructional computing course will have the opportunity to explore the content of the site as an online self-paced module. By allowing instructors to cover essential topics in an online environment, we believe this module will assist instructors in maintaining the breadth necessary in introductory courses. Moreover, online modules will conserve the limited face-to-face instruction time for in-depth coverage of more complex topics. Finally, the interactive format of the online module facilitates an active learning experience that increases student participation both in and out of class.

# Technology Standards in Teacher Preparation - ISTE NETS Distinguished Achievement Award Program

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2-3 representatives of the first group of ISTE NETS Distinguished Achievement Award institutions

**Abstract:**

The National Educational Technology Standards for Teachers (NETS•T) have been widely adopted by teacher preparation institutions. The ISTE NETS Distinguished Achievement Award has been created to recognize institutions that have exemplary examples of integrating the NETS•T standards into their teacher education programs. The first awardee institutions are to be announced in February with a second round of competition in April.

This presentation will include information about the award process with an emphasis on criteria for the April solicitation of nominees. It will also provide details of the first group of 6 awardee institutions, including concrete examples and models of the programs. This should be of value to those just starting the technology infusion process as well as those who have already made significant movement towards NETS•T implementation in their programs.

# ISTE NETS on the Digital Edge: Accomplished Teaching With Technology

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DESCRIPTION: Session features video exhibits of National Board Certified Teachers using technology effectively in their classrooms and associated curricular activities addressing ISTE NETS and NBPTS standards.

SUMMARY:
The purpose of this session is to inform the audience of exciting new resources for use in a variety of professional development environments that are designed to be used in preparing teachers or teacher candidates to use technology effectively in their classrooms. This session will provide video examples of exemplary teaching supported by technology with reflections from both the ISTE NETS for Teachers standards development team and National Board for Professional Teaching Standards (NBPTS).

The International Society for Technology in Education (ISTE), the National Board for Professional Teaching Standards (NBPTS), and Apple Computer joined forces to support new electronic learning environments where teaching resources and collaboration can occur. The resources will strengthen the mentoring relationship between the preservice teacher and experienced educators who guide them through the capstone student teaching and field experiences and/or provide opportunities for teachers to communicate for purposes of exchanging ideas for effective teaching.

Research has indicated that successful development of new teachers depends heavily on the student teaching experience. Key elements in the success of the new teacher include the collaboration and communication between the student teacher, the university supervisor, and the cooperating teacher; as well as, the models for excellent teaching that the student teacher observes and interacts with during this important phase of preparation. The Digital Edge project strengthens key experiences for student teachers by developing new strategies for a technology-based learning and communications environment. This environment provides a communications vehicle for a cohort of highly effective teachers who guide student teachers in their development.

A digital library of videos show examples of effective teaching with technology. National Board Certified Teachers (NBCTs) were videoed and support materials for each lesson including the teachers' own reflections were developed. Their reflections and those of National Board and ISTE representatives provide insights into the lessons and how those lessons address best classroom practice as well at NBPTS standards and National Educational Technology Standards (NETS).

The university teams and the NBCTs will develop curricula for integrating the digital library resources systematically providing resources first for early childhood and upper elementary; and then middle and secondary grade levels over the course of the project.

The project cohorts of ten -- one University Supervisor, three Preservice Teachers, plus their three respective National Board Certified Mentors and three K-12 Cooperating Teachers -- will begin Fall 2001 using their redesigned student teaching curriculum, digital video resources, and collaborative environment at each of the three collaborating university partner institutions: California State University, San Marcos; George Mason University, and Louisiana Tech University. The video exhibits, curriculum activities, and online collaborative environment may also provide opportunities for professional development and collaborations among inservice teachers as well.

The strong collaboration among the National Board Certified Teachers (NBCTs), university and K-12 faculties, and the preservice teachers will establish new learning environments resulting in future generations of teachers with high professional expectations and abilities related to effective use of technology in the classroom.

Participants will leave this session having experienced visual examples of how technology can be used effectively to support student learning, reflections from highly accomplished teachers (National Board Certified Teachers) on the lessons and how technology standards and National Board for Professional Teaching Standards have been met within the lesson, and with information regarding how the resources from this project can be accessed for use in their districts, universities, or classrooms.

Resources can be found at the following Internet locations: http://cnets.iste.org, http://www.nbpts.org and http://www.apple.com
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# An Award Winning Technology in Teacher Education Program: Description of a Comprehensive Approach

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**Abstract: The structures developed in the comprehensive technology in teacher education program recognized in 2000 by AACTE for "Best Practice in Teacher Education" are described. These structures include a technology mentoring program for faculty, a faculty technology scholar program, a school-based technology integration model that created technology-rich field experiences for students, a minor for preservice teachers in educational computing, and an undergraduate technology club for preservice teachers. The interconnection of all the structures is emphasized.**

## Introduction

Technology as a tool to improve teacher education is the primary vision that drives the comprehensive technology in teacher education program in the College of Education at Iowa State University. This innovative approach involves technology integration initiatives that impact the entire teacher education curriculum, including collaborative efforts with the College of Arts and Sciences, the College of Engineering, and PreK-6 schools. In the program, Iowa State University strives to prepare educators who are leaders and change agents in their schools and districts, who examine the role of technology in education, and who share their knowledge with colleagues and students. The program was recognized by the American Association of Colleges for Teacher Education (AACTE) in 2000 for Best Practice in Technology Integration in Teacher Education.

The purpose of this paper is to describe the structures and approaches that have been developed in this award-winning teacher education program. The major objective of the paper is to provide generalizable information that will be useful to other teacher education programs. Emphasis will be placed on the systemic and comprehensive nature of the technology in teacher education program at Iowa State University. We begin with a brief summary of the documented need for technology in teacher education programs like the one described here.

## Need for Technology in Preservice Teacher Education

Although preservice teacher education is the logical way to address the PreK-6 technology use problem, little has been done by most teacher education institutions to help faculty use instructional technology or to prepare preservice teachers who are capable of using technology in classrooms (Schrum, 1994). After completing a comprehensive review of the literature on information technology and teacher education, Willis and Mehlinger (1996) concluded:

> Most preservice teachers know very little about effective use of technology in education and leaders believe there is a pressing need to increase substantially the amount and quality of instruction teachers receive about technology. The idea may be expressed aggressively, assertively, or in more subtle forms, but the virtually universal conclusion is that teacher education, particularly preservice, is not preparing educators to work in a technology-enriched classroom (p. 978).

In 1998, the International Society for Technology in Education (ISTE) was commissioned by the Milken Exchange on Education Technology to survey schools, colleges, and departments of education to identify how they were preparing new teachers to use technology in classrooms (Milken Exchange on Education Technology, 1999). The primary purpose of the survey was to collect baseline information about the preparation of preservice teachers to use technology. Approximately one-third of the schools of education across the nation responded to the survey. Findings from the survey indicated that the technology skills of teacher education faculty are comparable to the technology skills of the students they teach; however, most faculty do not model the use of technology in their teaching. Although technology is accessible in the PreK-12 classrooms where preservice teachers receive their field experience, most preservice teachers do not use or integrate technology during their field experiences. One recommendation fom the Milken Exchange report was for researchers, professional societies, and education agencies to provide models that would identify, study, and disseminate effective uses of technology for both teacher education and PreK-12 schools. Preservice teacher education programs can significantly impact the future use of computer-related technology in PreK-12 schools by effectively preparing teachers who have the knowledge and the ability to use and integrate computer-related technology to enhance teaching and learning (Berney, 1991). Several expert groups strongly suggest that colleges and universities must take a leadership role in preparing preservice teachers to use and integrate computer-related technology in schools (Espinoza & McKinzie, 1994; International Society for Technology in Education, 1998; Office of Technology Assessment, 1995).

It is with these needs in mind that the teacher education program at Iowa State University has worked to establish a comprehensive approach to effectively integrating technology. The structures described in this article provide the basis of the program.

## The Structures

Several inter-connected technology integration structures that have been designed and implemented to enhance faculty development, teacher education courses, field experiences, and extracurricular activities for students are described in this paper. Collectively, these structures serve to improve the quality of the teacher education program through the careful and meaningful integration of technology. The structures that will be described include a nationally-recognized technology mentoring program for faculty, a faculty technology scholar program, a school-based technology integration model that creates technology-rich field experiences for students, a minor in educational computing program, teacher education courses in which faculty members model effective uses of technology, and an active undergraduate student organization called TECC (The Educational Computing Club). It is important to note that the department emphasis began in the early 1990's and that most of the structures have developed over a number of years (Thompson, Schmidt, & Hadjiyianni, 1995). One of the structures, the educational computing minor, was started in 1984, and although requirements for the minor have changed over time, it has continually provided the program with a core group of student leaders who positively influence students and faculty in the program.

## Technology Mentoring Program for Faculty

The technology mentoring program in the Iowa State University teacher education program has been in existence for eleven years. It may have the longest history of any such program in the United States and has been an integral part of our work in integrating technology throughout the program. The program began in 1991 and arose out of the need to provide more effective technology training experiences for the faculty in a large teacher education department. The original program developed from very practical considerations. It had become apparent that our workshop approach was not working and that faculty needed more individual attention. Given limited resources, the idea of using graduate students to provide the one-on-one experiences was especially appealing.

Thus, the program began in 1991 with the offering of the first graduate course, Curr 610 (Technology in Teacher Education). The seminar course included a field component and readings and discussions on issues in technology in teacher education. For the field component, the students were asked to mentor a teacher education faculty member for one hour each week during the semester. In the seminar class, discussion centered on both current readings and the mentoring experiences of each of the students.

The first semester of our mentoring experiment was successful, from the perspective of both the mentors and the mentees. Faculty participants were generous in their praise of the model, and the graduate students made it clear that the mentoring was an extremely valuable experience for them. Although we have changed and adapted our model over the years, the basic structure remains much the same. In ten years, we have had more than 100 graduate students work as mentors and more than 50 faculty members participate as mentees. Many of our graduate students have gone on to establish similar programs at colleges and universities around the country.

## Faculty Technology Scholar Program

Started through our PT3 Implementation grant, the faculty technology scholar program provides opportunities for faculty to focus upon developing classroom applications of technology. Through the grant, faculty are provided release time to work on technology, and graduate students assist them in this work. All of our technology scholars have also participated in the mentoring program and so come to the technology scholars program with previous experience. The technology scholars program builds on their previous experience by providing time and development support. Most of our faculty participants have chosen to use a summer month to work intensely to develop new technology-rich approaches in their courses. The technology scholars meet regularly to share ideas with each other and they also participate in workshops together. Faculty in the program include methods instructors in reading, mathematics, and science and also foundations and multicultural education professors. Applications developed by the scholars have included video case work in mathematics, palm pilot applications in science, and virtual reality applications for methods courses.

## School-Based Technology Integration Model That Creates Technology-Rich Field Experiences for Students

The Milken Exchange Report (1999) indicates that most teacher education students are not using technology in their field experiences. One obvious explanation for this problem is that PreK-6 schools may have neither the technology nor the teacher expertise to make such field experiences possible for students. In the early years of our technology in teacher education program, we found that many students were not finding opportunities to use technology in their student teaching and pre-student teaching field experience. In order to address this problem, we identified several partner schools and began work with technology integration with these schools.

The professional development model that emerged from this work shares characteristics with our one-on-one mentoring programs. We found that teachers in the partner schools were looking for technology solutions to instructional problems and that the needs of each teacher were different. Thus, we developed a model that allows teachers to work individually on their classroom technology integration ideas.

Each month, a team of technology experts spends one day in each of our partner schools. The team includes Iowa State education faculty, graduate students, technology consultants from our local Area Education Agency, and a master teacher in the area of technology who is in residence at Iowa State. Teachers in the partner school sign up for a two-hour period to work with the team, and during this time, a substitute teacher takes their class. Teachers are asked to bring an instructional issue to their inservice time and then are provided assistance in addressing this issue. Teachers may also bring team members back to their classes to provide assistance when they are trying their technology application in class.

Like the Iowa State faculty, participating PreK-6 teachers have been very positive about the individual assistance provided in this inservice model. After several years of work with our PreK-6 partners using this model, we now have technology-rich PreK-6 classrooms as placement sites for our preservice teachers. The preservice teachers themselves also bring expertise to the field, and they now have the opportunity to share this expertise and thus further develop the technology integration in the partner schools.

We believe that the field experience component is extremely important in preparing future teachers to use technology in schools, and that meaningful school partnerships are essential for technology in teacher education programs.

## Educational Computing Minor

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In response to the need to prepare preservice teachers to use and integrate computer-related technology throughout the curriculum, a minor in educational computing was designed for undergraduate students at Iowa State University. The minor, which was established in 1984, is offered for those teacher education students who wish to prepare themselves to become leaders in the use of technology in schools. Between 60-80 students majoring in early childhood education, elementary education, and/or secondary education are currently enrolled in the educational computing minor. All students in the minor are required to take at least 15 credit hours of coursework in educational computing and related areas.

Currently, the educational computing minor includes six courses: five instructional technology courses and one engineering course. In addition to the introductory instructional technology course and the three upper-level technology courses, students enroll in one engineering course offered by the College of Engineering. Faculty in the College of Engineering at Iowa State University have developed a course entitled "Toying with Technology." In the course, students examine how technological innovations work and the engineering principles behind them. Also, students are required to participate in a technology field experience. During this pre-student teaching technology field experience, preservice teachers have the opportunity to work in classrooms with area PreK-6 computer-using educators.

In recent years, students who have completed the minor have been the target of recruiting efforts, both in Iowa and around the country. As school districts work to improve their use of technology in schools, they seek out the Iowa State University students who have a specialization in this area.

## The Educational Computing Club (TECC)

In addition to the educational computing minor, students have the opportunity to participate in extracurricular and leadership activities involving technology. In 1996, the Educational Computing Club (TECC) was established by a group of preservice teachers in the College of Education at Iowa State University. TECC is an undergraduate student organization in the Department of Curriculum and Instruction that strives to help students learn more about technology use in the department and in PreK-6 learning environments. Although most TECC members are early childhood, elementary education, or secondary education majors, students from other university departments such as computer science, management information services, and industrial technology have joined the club. Currently, there are about twenty active members in TECC who organize and participate in the variety of activities the club offers. Many of TECC's activities involve working with teachers and students in PreK-6 classrooms and assisting the faculty, staff, and students in the College of Education with the use and integration of technology.

## Students: the Product

The ultimate products of all the structures in the technology in teacher education program at Iowa State University are the students who graduate from the program and begin their teaching careers. We are striving to prepare students who have had extensive experience learning and teaching with technology and who have the vision necessary to assume leadership in PreK-6 technology integration. With this goal in mind, the structures described here are all continually evolving as technology, students, faculty, and PreK-6 teachers all change and develop. The structures all work to reinforce each other in the creation of a comprehensive approach to technology integration.

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# The Impact of an Intensive Technology Integration Internship Program on Pre-Service Teaching Practices

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Abstract: Old Dominion University has partnered with Brunswick County Public Schools (Virginia) on a mutually beneficial program aimed at improving the instructional technology practices of Old Dominion's pre-service student-teachers and Brunswick County's in-service teachers. Part of the ACTT Now PT3 Program (Aligning Certification with Teacher Training), the ACTT Now internship program brings student-teachers from Old Dominion University—an urban university in Norfolk, Virginia—to Brunswick County—a poor, rural county, two hours from Norfolk. ACTT Now interns act as technology-integrating student-teachers exploring the rich variety of instructional technology options at their disposal in Brunswick County Schools.

## Introduction

One impediment to the integration of technology in schools is the lack of instructional technology training in pre-service institutions. Studies have shown that new teachers have not received adequate training in instructional technology at their university (Hargrave & Hsus 2000). Consequently, many of today's teachers are unprepared and disinclined to integrate technology into their classroom.

As a result of the increasing importance of technology in our society, teacher colleges and K-12 schools are attempting to train and encourage teachers to use technology in their lessons. Nationwide, new standards for student technology use in K-12 have been implemented (ISTE 2000). At the college level, program planners are frantically beefing up the technological components of their teacher training programs. At the national level, technology standards have been developed for the accreditation of new teachers, as well (NCATE 2000). However, even new teachers, recently out of university, are generally not given the kind of training and exposure they need in order to be proficient and feel comfortable integrating technology into their teaching (Solmon 1999).

## The Internship Program

The ACTT Now internship program is one component of the ACTT Now program (Aligning Certification with Teacher Training) that aims at promoting the integration of technology into everyday instruction in Brunswick County Public Schools. Operating in conjunction with Old Dominion University's Darden College of Education, the ACTT Now internship program is a fully credited alternative to the standard student-teaching model provided by the university. The program seeks to prepare pre-service student teachers to become effective, confident teachers and technology leaders in their schools. The high emphasis on instructional technology training and everyday use provides ACTT Now interns with a structured and supportive environment to experiment with new technologies.

The ACTT Now internship program uses a unique approach to accomplish its technology goals. A weeklong orientation program starts off the semester. In addition to introducing instructional technologies, the orientation schedule includes interactive seminars on subjects like classroom management and goal setting. Once school starts, two-hour technology seminars are held each week to continually introduce new classroom technology strategies. The interns are then expected to implement what they have learned in their classrooms and include it in an electronic technology portfolio they are required to create.

The program lasts a full semester, according to Brunswick County's schedule (18 weeks). Because Brunswick County is 100 miles from Old Dominion, all of the interns stay in houses that the school system rents and furnishes for them (with internet connectivity), free of charge. Additionally, the interns are provided the use of a personal laptop computer for the duration of the program and a $4,000 stipend. Generally, they teach for half of each school day, taking on full instructional responsibility during that time. The rest of the day, they use for lesson planning, observation of other teachers, tutoring, and curriculum planning.

## Results

The ACTT Now internship program has completed three semesters since its inception in the Fall of 2000. To date, 29 interns have participated in the program. A variety of assessment strategies have been used to determine the strengths and weaknesses of the program. Surveys and recorded interviews have been utilized to assess intern's perception of technology. Through these surveys, it has been found that interns learn more about how technology can be used in the classroom than they did during their pre-service training. Perhaps the most significant finding from these surveys has been that every intern, without exception, has felt that this program has better prepared them for teaching than a standard student-teaching experience. Not only do ACTT Now interns feel like they are more familiar with the latest classroom technologies, they feel like they have attained a higher degree of comfort and confidence managing the classroom than they would if they had participated in a more traditional student-teaching setting.

Interns are required to document every time they use technology in the classroom using a simple technology log. With the information contained in the technology logs, the ACTT Now staff is able to assess what kinds of technology the interns use in their classrooms and how frequently they use it. From the three semesters of the internship program, it is clear that each group of interns has succeeded the previous group in the diversity and number of instructional technology applications in their classrooms. During the first semester of the program (Fall 2000), the interns began using digital projectors, the Internet in their classrooms, and simple presentational programs such as PowerPoint. The second semester saw interns moving past the initial steps of the first interns. Aided by a group of interns who had prior experience with technology, the Spring 2001 interns used a variety of educational software options, developed and implemented web quests, created personal web pages, used digital cameras, projectors, and mobile laptop labs. The third semester (Fall 2001) has been the most successful semester so far. This cadre of interns has exhibited a focused and consistent effort to integrate technology into their classes. They have succeeded in making technology a central part of their instruction. Three of the interns modeled their unique technology infusion strategies in training sessions attended by Brunswick in-service teachers. A few others have taken the initiative to help start a monthly technology training seminar for the parents of their students and interested members of the Brunswick community.

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# Simulations, educational technology, and teacher preparation: Working towards authentic student experiences in a required technology course

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## Abstract

This study examines efforts to improve students' knowledge of and comfort with technology by incorporating simulations and constructivist strategies in a short (five week) educational technology course serving 150 students. The web-enhanced lecture/lab course is offered as one of the first courses in a year-long M.Ed. teacher preparation program at a large urban Midwestern university. The study uses multiple data sources including questionnaires, professor and teaching assistant field notes, course projects, and online postings in order to determine how students responded (in terms of efficacy, knowledge, and comfort using technology) to a simulation in which they acted as a consultant hired to help a fictitious teacher become compliant with the six (6) ISTE National Educational Technology Standards (NETS) for teachers.

## Introduction

The five week course examined in this study (ET700 – not the real course number) was offered during the summer in 2001. ET700 is the only required technology course for pre-service teachers in a year-long M.Ed. program at this university and is generally taken as one of the first classes in the students' coursework. In response to research indicating a single stand-alone technology course is not sufficient to prepare pre-service teachers to use technology effectively in their early practice (Hunt, 1994; Moursund & Bielefeldt, 1999; Wetzel, 1993) the teacher education program in which ET 700 is offered is moving towards an infusion model of technology across multiple courses (Topp, Thompson, Schmidt, 1994).

Using a web-enhanced (WebCT) lecture/lab format, ET700 provides students with basic technology skills (Strudler, 1991) in web development, presentation software (e.g., Microsoft PowerPoint), and spreadsheets (i.e., Microsoft Excel) and teaches them how to evaluate technology resources (i.e., web sites and educational software), use electronic communication including discussion boards and create lesson plans that incorporate technology in teaching higher order thinking skills including problem solving. A consistent challenge in ET700 has been offering students an authentic context in which to complete course projects because most students in the course have had no classroom teaching experience.

During the quarter in which this study took place the course incorporated a new strategy. Students were asked to engage in a simulation in which they acted as a consultant to help a fictitious K-12 teacher (i.e., teacher-client) become compliant with the ISTE National Educational Technology Standards (i.e., NETS) for teachers.

Through the use of web-based resources, scenarios, and online discussion, students constructed a teacher-client profile that provided the foundation for all course projects. Online resources to complete the teacher-client profile included links to local school districts and schools, national curriculum standards for K-12 general education and subjects including English, Science, Math, and Foreign languages. The teacher-client profiles required students to consider issues related to technology integration including school environment and resources, classroom makeup and technology resources, and the teacher-client's pedagogical philosophy and attitudes towards technology. Students created all course projects for their teacher-client.

Students leave ET700 with a complete web-based teaching portfolio that includes all course projects, as well as their reflections on these projects. The course teaches students a constructivist approach in which technology is treated as only one aspect of the classroom ecology.

## Theoretical Framework

Constructivist theories (see Ernest, 1996) and theories of situated learning (Brown, Collins, & Duguid, 1989) were used to guide course planning, delivery, in-process course modifications, and evaluation. The planning of discussions and lessons surrounding the introduction of technical topics reflects, in part, the social constructivist positions of Vygotsky (1962), and his followers. At the same time the ways in which the technical material was introduced reflect the influence of the constructivist theories of individual knowledge building following von

Glasersfeld (1994), situated learning (Lave and Wenger, 1991), and instructional design for constructivist learning (Duffy & Jonassen, 1992; Willis & Wright. 2000).

## Data Sources

Data collected for this study includes questionnaires administered online to students at the beginning and end of the course, online postings of students on a discussion board, course projects and papers, and professor and teaching assistant observations and field notes.

The initial questionnaire included questions about students knowledge of and comfort with various media and computer technologies including, word processing, computer graphics, videography, spreadsheets, databases, platform knowledge (i.e., Macintosh and Windows), desktop publishing, web authoring, email, digital photography, presentation software, asynchronous and synchronous online communication, and lesson plan development. Students concluded the course by filling out a questionnaire that contained many of the same questions as the original questionnaire, as well as the following open ended questions:

1) How helpful did you find the teacher-client profile in creating a context for your assignments? In your response, please address what information that your drew from to create your profile (i.e., links to national curriculum standards, links to school districts and schools, personal experience, etc.). How did the profile influence your thinking about your projects?

2) How would you describe your general level of knowledge and comfort using technology to teach after taking this course? Please be as specific as possible.

Other sources of data include students online postings in which they discussed their attitudes about and comfort with technology, reactions to course readings that focused on more critical exa minations of technology in education (Healy,1998; Postman, 1992). Course assignments including a final reflection paper in which students assessed how their projects met the six ISTE standards.

In addition to the above mentioned data sources, the professor visited each lab session daily and took field notes focusing on student's processes of learning software, questions about the teacher-client profile, and interactions with each other and the teaching assistant. The professor took these notes as a participant observer helping students with technical and conceptual issues. Teaching assistants also took field notes related to how students were utilizing their teacher-client profiles and progressing through their assignments.

## Preliminary Results

Initial analysis of the data indicates that students were most knowledgeable and comfortable with basic word processing, email and web browsing. Their low self reporting of knowledge and comfort with lesson plan creation is consistent with this course being an early class in their teacher education program. For most of the measures that asked questions about desktop publishing, graphics, multimedia development, database software, etc. students answered with means for knowledge and comfort below two (out of five). Therefore students entering into the course generally possessed little more than basic knowledge about computers and Internet technologies and had little methods background in education.

Initial analysis from field notes (Professor and TA) indicates that many students struggled with writing the profile although they were supplied with all the basic materials of the profile including information about local school districts, classrooms, and curriculum standards, classroom considerations relating to special needs students, multicultural issues, and the use of technology resources. The assignment was vague enough so that students would not follow a formula, but rather work through their dissonance to see the interrelationships between each aspect of a class including technology. By the end of the quarter students had been required to refer to their teacher-client profiles to complete all course assignments including a web site/educational software evaluation, spreadsheet and presentation software project, and technology-based lesson plan. The final course assignment was to write a reflection paper reviewing how student's projects had helped their teacher-client meet the 6 ISTE NETs standards for teachers.

Many students in their reflection papers and end-of-course questionnaire indicated that the teacher-client profiles were helpful in thinking about their projects by giving them concrete design parameters. In addition, TAs who had taught the labs before, indicated that projects were more consistent, compared to previous classes, with one another in terms of grade and subject appropriateness due to the profile. A closer examination of the reflection papers, however, revealed some of the disadvantages of the simulation. One observation that became immediately apparent when reading the reflections papers is that the teacher-client profile represented a static snapshot and that it did not and could not capture the ever changing dynamics within a K-12 classroom.

## Conclusion

Other areas that are receiving further analysis of the data in this study include comparing students comfort with and knowledge of educational technology integration before and after the course. This data will be further compared with field notes taken towards the end of the quarter to determine if students self-reporting were consistent with the field notes. In addition, a closer analysis will be undertaken of the students' projects to determine which classroom issues students gave their primary pedagogical attention. This will provide further evidence of how successful the teacher-client simulation was in inviting students to think beyond computer skill acquisition to the multiple issues affecting successful technology integration.

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# Practical applications of technology in the General Methods course

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Beginning in the 2001-02 school year, the College of Saint Catherine implemented a requirement of lap top computers for all new Education majors. This created an opportunity for the faculty to reexamine their teaching methods and course content. How could courses be designed so that technology would be utilized during class and for outside class projects? Successful instructors in higher education know that adults are self-directed and expect to take responsibility for their decisions (Knowles, 1984). Technology enhanced instruction that allows students to follow at their own rates on personal computers allows self-direction and personal responsibility.

General Methods and Teachers as Leaders are two of the foundation courses in the Education program. The students are preservice teachers who have little, if any, experience in the classroom. Along with inexperience in the field of teaching came students with varying levels of technology expertise. Pedagogy and foundation information had to be taught along side technology instruction. Collaborative learning, multimedia presentations, and interactive learning have been used in other higher education classrooms with mixed success (Taylor, 2000). St. Catherine's was very supportive in providing in-house training for faculty and staff. Despite the support of time, materials, and a technology team, the challenge to implement came in changing how the faculty teaches classes. This is not unique to St. Catherine. Kim Carter (2001) sees teaching teachers to use a new approach to teaching has a major challenge in the k-12 setting and college setting. Only through continuing practice and a willingness to risk can a lap top program exist and hopefully improve.

As students in the General Methods classes searched the web for resources, they were pleased with the amount of resources available to educators. The instructors facilitated the "surfing" by providing web links and teaching students how to use key word searches to find additional sources. Lesson planning, assessments, and sample lessons were abundant. One of the first tasks worked on together was setting up criteria to determine the usefulness and reliability of specific web sites. Technology assignments were given in the areas of philosophers of education, parental involvement, special education advocacy, assessment methods, and lesson planning. Students explored and wrote about two of the topics citing three web sources in each paper. This information was placed in a public file so that the entire class could access the information.

Deciding if a web site was reliable was done with a consensus model. The class would visit the sites and study the information. Criteria eventually evolved. Creators and authors of the web site were identified and any additional information, such as affiliations were noted. The critique continued by examining the content of the site based on our definitions. For instance, when a lesson planning site was presented, the objectives and plan itself were examined to make sure that the lesson was well organized. If a plan was sketchy or if components were missing, students begin to see this and comment.

In the attempt to make lessons coherent and uniform, a lesson plan template was also created. This occurred early in the term and the template was used for all lesson planning. As the students continue in the program, the template will be used to create future lessons in their special methods courses. This uniformity will allow the instructors to use common vocabulary and also provide a continuum of improvement. As the students become use to the template, they will be able to concentrate fully on the content of the special methods course rather than struggle with lesson plan format.

PowerPoint presentations were used extensively by both the instructor and the students. In order to encourage discussion, the PowerPoint presentation for the classes were emailed as an attachment to the students before the class. A copy was also placed in the public folder so that students could access it throughout the course. As compared to previous years, students came to class ready to discuss the information presented in the PowerPoint. Often they would bring questions that had arisen while they viewed it. Because they had the opportunity to preview it at their leisure, they could time to read it closely, review it, and respond to it.

Email was used extensively during the school term. Uses included questions to the instructor and assignments sent as attachments. One organizational trick that was learned is to use a specific address line with incoming email. By using a common subject, individual emails would be placed in a folder. It was not unusual when assignments were due for the instructors to open email and find 60+ responses and attachments. By using a coded address line, the mail will automatically go into a folder for viewing at a later time.

The students themselves used technology to enhance their units and assignments. Products ranged from brochures to PowerPoint presentations. Traditional assignments, such as creating a unit and producing a research paper, were done with the WORD program. Worksheets, assessment tools, including rubrics, and graphics were all submitted. The quality and creativity of the units this year are higher than previous years. Instructions on programs were offered in class with additional support from "brown bag" lunch instruction with the media specialist. This took pressure off the instructors and allowed students to progress at a rate that was comfortable for them.

Students also will have a complete electronic portfolio at the end of their teacher training. This portfolio will be burnt onto a compact disk. As students move through the program, the instructors will encourage additions to the portfolio. In Teachers as Leaders and General Methods, students created and inserted a cover page, resume, essay on why they choose teaching, and a philosophy of education.

### Student opinions

At the end of the term a survey was distributed. Results showed that the majority of students found the technology component of the class at the right level. Frustrations, however, were noted.

"Have everyone's right email address." A comment like this shows the details that can easily be overlooked when setting up a lap top program. Generally students were positive about learning about a PowerPoint, templates, and what to look for when accessing a web site.

Most negative or neutral expressed opinions dealt with the cost of leasing a lap top computer. The students must lease a computer from the College of St. Catherine with the fee being levied each term. Although the lease fee may be added onto financial aid, many students were dismayed because they had their own personal lap top computers. This criticism became heard less often as the term progressed. Students appreciated being able to move readily from one site to another because everyone was using the same server and computer platform.

In conclusion, as the program moves into a second term, students and instructors both appear to be more comfortable with the use of laptops in the classroom. As instructors work through these first sections, journals of what worked and frequent meetings have eased some of the anxiety. The students in the program witness the extensive use of computers in k-12 settings during their field experiences. They know that personal computer skill, an electronic portfolio, and an ability to train other teachers in technology will make them much more marketable. The content of the classes will continue to be presented in a technology heavy way. The goal for the College is to give future teachers the ability to use technology to save time and help their own students flourish.

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# Assessing Mentoring Teachers' Technology Proficiency: What Do They Have to Say?

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## Abstract

This paper focuses on one teacher preparation program's efforts to address a lack of congruence between modeling the effective use of technology in university coursework and appropriate use of technology during the teacher candidates' field experiences (Strudler, McKinney, & Jones, 1998). Questionnaires were administered on technology proficiency and different uses of technology to 54 elementary mentor teachers who participated in a "clinical faculty" class designed to strengthen their mentoring of pre-service teachers. The mentor teachers' responses indicated self-perceptions of proficiency, areas of need for further training, and contradictions related to the teachers' self-perceptions of their skills and abilities

## Theoretical Overview

Teacher candidates need opportunities to see, use, and implement technology during their field experiences, especially student teaching. Strudler, McKinney, & Jones, (1998) found that while effective modeling of technology in education courses had positive effects on students' attitude toward using technology, the improved attitudes were limited if teacher candidates were not provided opportunities to learn about and apply skills and strategies in field experiences and student teaching. To insure that teacher candidates have these opportunities, mentor teachers need to model the integration of technology in the curriculum. The purpose of this study was to examine the technology proficiency and different uses of technology of elementary mentor teachers who participated in a school/university partnership "clinical faculty" class designed to strengthen their mentoring of pre-service teachers.

During the 1998-99 academic year, George Mason University redesigned its teacher preparation programs in response to changes in state licensure requirements. In the program redesign, technology was integrated across all courses so students were provided with models of how to teach with technology (White & Sprague, 2001). Field experiences were also integrated into all coursework with a full time internship serving as a "capstone" of the program. In the first year of the program the pre-service teachers indicated that even though there was access to hardware in their classroom, some of the mentor teachers were not using technology in their teaching on a regular basis or were using technology in ways that were incongruent with the models of how to teach with technology provided in their coursework. Based on this feedback from these first year pre-service teachers, it became apparent that there was a need to work directly with mentor teachers on: 1) *how to use technology* (skills and proficiency) and 2) *how to use technology effectively* (integrating technology into teaching) in elementary classrooms.

## Survey Administration and Results

Questionnaires were administered on technology proficiency and different uses of technology to 54 elementary mentor teachers who participated in a school/university partnership "clinical faculty" class designed to strengthen their mentoring of pre-service teachers. The surveys were developed to assess the mentor teachers' areas of interest for a session intended to provide different strategies for effectively integrating technology into elementary classroom instruction. The mentor teachers' responses provided information on self-perceptions of proficiency and areas of need for further training. Areas of highly perceived proficiency (over 70% of the mentor teachers responded positively to their perceived proficiency on particular types of technology) included performing computer basics, selecting software for a particular subject area or instructional goal, integrating technology activities into their classroom, and allowing students to use the Web to conduct research. The two lowest areas of perceived proficiency were using spreadsheets (44%) and databases (41%) while 62% of the teachers indicated that they could create graphics or digital displays and 61% indicated they have students create multimedia presentations (mostly with PowerPoint). In terms ofproficiency as measured by the state technology assessment for teachers, 87% of the teachers indicated they were familiar with the Virginia Technology Standards for Instructional Personnel (TSIPS) while 75% of the teachers indicated that they had passed the TSIPs.

The responses indicated that there were contradictions and problem areas related to the teachers' self-perceptions of their skills and abilities. The teachers' perceptions did not match the expectations of technology proficiency outlined by the state department of education and the teacher education program. Virginia requires teachers to pass eight technology standards (TSIPs) in order to renew licensure (http://www.pen.k12.va.us/VDOE/Compliance/TeacherED/tech.html). These standards are assessed by the local school district. To determine proficiency, many of the districts require the teachers to either enroll and complete a technology course or produce a portfolio demonstrating their technology competencies. In terms of this research, 75% of the mentor teachers indicated that they had passed the state-required technology proficiencies and yet, many of them also indicated they did not typically use technology in their classrooms and were not familiar with databases, spreadsheets, or multimedia, although these areas were part of the state-required technology standards. A better assessment of teachers' proficiencies in the area of technology integration needs to be developed to determine if these teachers have truly mastered the competencies required by the TSIPs. The university also needs to work closely with these teachers to ensure that the skills learned in the district-required technology course transfer to actual practice within their classrooms. This will allow preservice teachers to see technology modeled in their field experience placements in addition to their teacher preparation courses.

Another area of interest has to do with the number of clinical faculty who felt comfortable sharing what they do with other teachers in the course. All of the teachers in this course were learning how to mentor a preservice teacher. Their principals had been selected them as outstanding teachers. These clinical faculty were being asked to supervise a preservice intern. Even more important they were asked to demonstrate how they teach and discuss their thinking behind each lesson, a process that requires them to be open to questions and to be reflective. However, when asked if they would be willing to share one idea they have for integrating technology only 21% were willing to share with their fellow teachers in the course. The majority of the teachers were unwilling to share despite the fact that 92% indicated they integrated technology regularly in their classrooms. If these teachers are uncomfortable with sharing their ideas for integrating technology with their colleagues, how open will they be to sharing their technology ideas with the preservice interns? Opportunities need to be provided that would allow mentor teachers to become comfortable with sharing their technology integration ideas with others. They need to be encouraged to present workshops or at local conferences so they gain self-confidence in sharing their technology integration ideas.

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# Supporting Teacher Training Programs with an Electronic Reserve System (ERes)

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## Introduction

Isaac Asimov said, "I do not fear computers, I fear the lack of them." The field of education seems to concur with this statement as a recently developed survey posed the following question: Are your teachers required to demonstrate technology skills for new or continued employment with your district? If technological competency is to be considered a decisive factor regarding teacher employment, then it is the responsibility of every teacher education program to provide the necessary training. According to the National Center for Education Statistics (2000), "the barriers most frequently reported by teachers to be 'great' barriers to their use of computers or the Internet for instruction were not enough computers and lack of release time for teachers to learn how to use computers or the Internet" (p. 89). The National Council for Accreditation of Teacher Education (NCATE) (2001) stipulates that institutions of higher learning must integrate technology into all aspects of their teacher education programs. The International Society for Technology in Education (ISTE) in affiliation with the National Council for Accreditation of Teacher Education has developed rigorous accreditation guidelines for the inclusion of technology in teacher preparation. The National Educational Technology Standards (NETS) Project (2000), a program that concentrates on preservice teacher education as a division of the International Society for Technology in Education (ISTE), has defined specific concepts, knowledge, and skills considered essential in order to apply technology within educational settings.

The Internet provides access to newly developed disciplinary and interdisciplinary databases; authentically-based, real-time experiences; and other communities not available through text-based material. Recent research and evaluation studies indicate that the school improvement programs employing technology in the areas of teaching and learning show positive results for both students and teachers. Responses of students regarding electronic instruction include the following positive observations: participation in class discussions took place without any one individual monopolizing the conversation; students felt that a greater depth of learning occurred; and the flexibility and convenience of on-line activities were considered beneficial (Brown, 2000). Negative aspects of electronic instruction include a feeling of disconnectiveness from class members with no face-to-face contact, a lack of consistent communications, technical challenges, and confusing feedback (Brown, 2000). In spite of the negative perspectives, technologically mediated instruction offered at a distance is becoming an important feature in the realm of higher education.

While many advantages to on-line instruction (ease of scheduling, convenience, lower cost) exist, numerous concerns (the quality of instruction, lack of interaction with faculty and fellow students, technical limitations) have also surfaced. This article examines a bridge between an on-line course and traditional classroom based instruction. Software developed by Docutek Information Systems, Inc. (www.docutek.com) has enabled faculty members at Drury University and over 220 other institutions of higher learning to utilize the best of both worlds. This software is ERes v4.1 and has been in use at Drury University since the beginning of the 1998-1999 academic year.

## ERes Systems in the Literature

ERes is short for electronic reserves. ERes systems have helped to shape the teaching and learning environments of higher educational institutions around the world. Kesten and Zivkovic (1997) described ERes as a stand-alone system that used intuitive, point and click interfaces along with context-sensitive help. This eliminated the need for extensive technical training in order to use the system. Dugdale (1999) highlighted the scarcity of resources in academic libraries as well as pressures from growing student populations and the introduction of new pedagogical processes as the main reasons for the rise of ERes systems. Major institutions in the United States, such as Kent State University, have also utilized ERes (Kristof & Klinger, 2000). One possible limitation of ERes systems revolves around the issue of copyright infringement. An excellent article showing how Portland State University resolved this conflict is found in Anderson and DeMont (2001). One exciting application for the future is described by Rodoni, Bertone, and Estella at Santa Clara University in Santa Clara, California. These students acknowledge the current limitations of ERes allowing students and faculty the ability to search for course information only at their own institution. They conceptualized the creation of a collaborative function within the ERes system enabling students and faculty to search for course material from other universities as well as their own. This will provide a powerful tool for faculty collaboration and virtual learning (Rodoni, Bertone, & Estella, 2000).

## Rationale for Incorporating ERes

One of the problems with traditional classroom-based instruction is the limitation of time. Students are expected to be in class at a certain time and to remain there until the class period is over. Professors are expected to have posted office hours and be available to their students. All of this depends upon time and physical proximity. It results in a synchronous dilemma. If the student or professor cannot be at a certain place at a certain time, then instruction and/or mentoring and advising cannot take place. What is needed is an asynchronous system. Better yet, a combination of the two.

The advent of email has made communication between students and professors a much easier task. It has limited the need for synchronous interactions. With email, a student can communicate with the professor from anywhere at anytime. This is the basic premise also of on-line, web-based education. The student and professor conduct their business in an asynchronous fashion. The lessons are posted to web sites and the students view the material at their leisure.

What about the student whose technical limitations (whether personal or computer-based) interfere with the learning process? What about those students who need the social interaction that comes from traditional classroom-based instruction? Fortunately, the issue is not an either/or proposition. There is a middle ground or bridge between the synchronous and asynchronous methods of teaching. This is the domain of ERes.

With the ERes system, a professor can make available on-line any course-related information. While students and professors interface in the traditional classroom environment, professors can also post messages for students to view when they access the ERes page, or students and professors can participate in an on-line chat room. These components provide for an educational experience that combines both in-class interaction and instruction (synchronous) and out-of-class (asynchronous) activities that are available anytime.

## Drury University and Teacher Education

Drury University is a private, liberal arts university established in 1873. Drury offers numerous programs of study at the undergraduate and graduate level, including teacher education. Drury operates from two main campuses, in Springfield, Missouri and also Fort Leonard Wood, Missouri, with smaller, statewide satellite campuses in Rolla, Lebanon, Ava, Stockton, Thayer, and Cabool. Students wishing to be certificated to teach in Missouri may take introductory education courses at any of the satellite campuses, or they may complete their degree at either Springfield or Fort Leonard Wood.

In order to facilitate teacher training, Drury University faculty have begun utilizing the ERes system to provide students with necessary materials and asynchronous communication abilities. Drury University has made a commitment to provide current technological tools to students and faculty members.

Many of the students at the satellite campuses would be considered non-traditional. Since most of these students commute to class once or twice a week from a significant distance, it is difficult to schedule appointments with the education faculty members. One way of facilitating a balance is through ERes.

## Specific Examples of Teacher Training Facilitation

During the spring semester 2001, one course (Teaching Methods of Elementary Science-EDUC 382) was conducted using ERes by posting course syllabus, scoring guides, lesson plan templates, a link to the School of Education and Child Development homepage at Drury University, and pictures. Other functions of the ERes page included the capability of posting announcements, discussion boards, chat rooms and links to education resources, the university library, and university homepage. Students do not have the ability to post material directly to the page (with the exception of the discussion board and chat room); this is the responsibility of the professor teaching the course. Students do have the ability to view and download any of the submitted lesson plans by entering a password.

While there are other programs and software available for faculty-student interaction, including some very high powered and sophisticated systems like WebCT, BlackBoard 5.02, or Web-Mediated CourseAssistant (Web-MC), what is sometimes needed is simply a way for faculty and students to interact without a great deal of extra features. ERes provides for the posting and downloading of information without requiring extensive training. Although it does not contain as many "bells and whistles" as other programs, it does meet the needs of the education students at Drury University. From one course using ERes in Spring 2001, the authors have expanded the use of ERes to include a majority of their courses.

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ERes is short for electronic reserves. ERes systems have helped to shape the teaching and learning environments of higher educational institutions around the world. Kesten and Zivkovic (1997) described ERes as a stand-alone system that used intuitive, point and click interfaces along with context-sensitive help. This eliminated the need for extensive technical training in order to use the system. Dugdale (1999) highlighted the scarcity of resources in academic libraries as well as pressures from growing student populations and the introduction of new pedagogical processes as the main reasons for the rise of ERes systems. Major institutions in the United States, such as Kent State University, have also utilized ERes

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(Kristof & Klinger, 2000). One possible limitation of ERes systems revolves around the issue of copyright infringement. An excellent article showing how Portland State University resolved this conflict is found in Anderson and DeMont (2001). One exciting application for the future is described by Rodoni, Bertone, and Estella at Santa Clara University in Santa Clara, California. These students acknowledge the current limitations of ERes allowing students and faculty the ability to search for course information only at their own institution. They conceptualized the creation of a collaborative function within the ERes system enabling students and faculty to search for course material from other universities as well as their own. This will provide a powerful tool for faculty collaboration and virtual learning (Rodoni, Bertone, & Estella, 2000).

### Rationale for Incorporating ERes

One of the problems with traditional classroom-based instruction is the limitation of time. Students are expected to be in class at a certain time and to remain there until the class period is over. Professors are expected to have posted office hours and be available to their students. All of this depends upon time and physical proximity. It results in a synchronous dilemma. If the student or professor cannot be at a certain place at a certain time, then instruction and/or mentoring and advising cannot take place. What is needed is an asynchronous system. Better yet, a combination of the two.

The advent of email has made communication between students and professors a much easier task. It has limited the need for synchronous interactions. With email, a student can communicate with the professor from anywhere at anytime. This is the basic premise also of on-line, web-based education. The student and professor conduct their business in an asynchronous fashion. The lessons are posted to web sites and the students view the material at their leisure.

What about the student whose technical limitations (whether personal or computer-based) interfere with the learning process? What about those students who need the social interaction that comes from traditional classroom-based instruction? Fortunately, the issue is not an either/or proposition. There is a middle ground or bridge between the synchronous and asynchronous methods of teaching. This is the domain of ERes.

With the ERes system, a professor can make available on-line any course-related information. While students and professors interface in the traditional classroom environment, professors can also post messages for students to view when they access the ERes page, or students and professors can participate in an on-line chat room. These components provide for an educational experience that combines both in-class interaction and instruction (synchronous) and out-of-class (asynchronous) activities that are available anytime.

### Drury University and Teacher Education

Drury University is a private, liberal arts university established in 1873. Drury offers numerous programs of study at the undergraduate and graduate level, including teacher education. Drury operates from two main campuses, in Springfield, Missouri and also Fort Leonard Wood, Missouri, with smaller, statewide satellite campuses in Rolla, Lebanon, Ava, Stockton, Thayer, and Cabool. Students wishing to be certificated to teach in Missouri may take introductory education courses at any of the satellite campuses, or they may complete their degree at either Springfield or Fort Leonard Wood.

In order to facilitate teacher training, Drury University faculty have begun utilizing the ERes system to provide students with necessary materials and asynchronous communication abilities. Drury University has made a commitment to provide current technological tools to students and faculty members.

Many of the students at the satellite campuses would be considered non-traditional. Since most of these students commute to class once or twice a week from a significant distance, it is difficult to schedule appointments with the education faculty members. One way of facilitating a balance is through ERes.

### Specific Examples of Teacher Training Facilitation

During the spring semester 2001, one course (Teaching Methods of Elementary Science-EDUC 382) was conducted using ERes by posting course syllabus, scoring guides, lesson plan templates, a link to the School of Education and Child Development homepage at Drury University, and pictures. Other functions of the ERes page included the capability of posting announcements, discussion boards, chat rooms and links to education resources, the university library, and university homepage. Students do not have the ability to post material directly to the page (with the exception of the discussion board and chat room); this is the responsibility of the professor teaching the course. Students do have the ability to view and download any of the submitted lesson plans by entering a password.

While there are other programs and software available for faculty-student interaction, including some very high powered and sophisticated systems like WebCT, BlackBoard 5.02, or Web-Mediated CourseAssistant (Web-MC), what is sometimes needed is simply a way for faculty and students to interact without a great deal of extra features. ERes provides for the posting and downloading of information without requiring extensive training. Although it does not contain as many "bells and whistles" as other programs, it does meet the needs of the education students at Drury University. From one course using ERes in Spring 2001, the authors have expanded the use of ERes to include a majority of their courses.

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# Pre-service and In-service Teachers' Knowledge, Experience, and Perspectives on Portfolio Assessment: A study in Taiwan

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**ABSTRACT:** This study focuses on pre-service and in-service teachers' knowledge, experiences, and views of portfolio assessment and its use in school settings, as well as the possibility of applying portfolios in their classrooms. This paper first describes the rationale of portfolio assessment; then describes the research purposes and questions as well as methods used in the study. It also reports the results of data analyses and provides conclusions and implications in relation to portfolio practice and teacher education.

## Rationale

Portfolio assessment has become more and more popular within general educational settings (Simmons, 1990). It presents one of the alternative ways to measure student performance in a broader range and context that measures both the product and the process of students' learning and also values the evaluation of students' achievement along with their effort and improvement (Tierney, Carter, & Desai, 1991). Paulson, Paulson, and Meyer (1991) proposed one of the most specific definitions: "A portfolio is a purposeful collection of student work that exhibits the student's efforts, progress, and achievement in one or more areas. The collection must include student participation in selecting contents, the criteria for selection, the criteria for judging merit, and evidence of student self-reflection" (p. 60). Portfolio assessment allows students to learn different kinds of complex skills and to demonstrate their ability in an authentic context where their learning occurs naturally. On the other hand, portfolio assessment also provides teachers the opportunity to observe students' performance in the authentic context and to get rich information and valuable quality of data for evaluation and instruction. In this regard, portfolio assessment could be a very powerful technique to serve as both instructional and assessment tools for program with special objectives, which can help teachers in a variety ways.

As researchers have pointed out, there certainly are both positive and negative aspects of the use of portfolio. Calfee & Perfumo (1993) conducted a nationwide survey of portfolio practice that includes states, districts, schools, school teams, and individual teachers, focusing on writing assessment. They found that teachers who are in portfolio movement show an intense commitment and personal renewal. On the other hand, most teachers experienced portfolio practices revealed that they have been struggled with management problems such as time and organization in using portfolio and some teachers even thought that the portfolio was not worth the effort (Salinger and Chittenden, 1994). Moreover, another major concern about the portfolio assessment is that it has often been criticized as lack of technique adequacy such as validity was assumed to exist and reliability were not discussed (Calfee & Perfumo, 1993; Moss, 1992, 1994; Nolet, 1992). Still another critical issue in using portfolio in the classroom has to do with the amount of support from the school or district. However, Salinger and Chittenden (1994) claimed that, even though portfolios may not have spurred instructional reforms in their district, the use of portfolios with the intention of assessing instruction helped improve their program.

Since the concepts of portfolio assessment are still relatively new to many educational practitioners, teachers may need to improve professional development to be able to implement portfolio practice effectively (Calfee & Perfumo, 1993). Both pre-service and in-service teachers need to be trained to have better understanding of theories and practices of portfolio assessment and well as to increase their awareness of emerging perspectives of portfolio and the technology applications. While the portfolio assessment is especially not yet so prevalent in schools of Taiwan, it is very important to understand to what extent teachers are acquainted with the idea of portfolio assessment and how well they have prepared to take this movement. Therefore, this study set forth to investigate pre-service and in-service teachers' experiences of, and attitudes toward their use of portfolio assessment in classroom practices. Moreover, this study tries to examine how the knowledge and experience of portfolio assessment as well as some background variables can affect both pre-service and in-service teachers' willingness in implementing any kind of portfolio practice in their teaching.

## Methods

The target subjects were both pre-service and in-service teachers who had or are enrolled in the Education Program of a university in northern part of Taiwan. A survey questionnaire developed by the researchers composed of 50 Likert-type questions and 6 open-ended questions were distributed to collect knowledge, experiences and views of 124 subjects on portfolio assessment and electronic portfolio application.

## Results

Most pre-service and in-service teachers in this study stated that they have none to few experiences in portfolio practices. Some of them have learned theories and applications of portfolio assessment in pre-service or in-service training courses, and many of them have shown positive attitude toward the portfolio assessment approach. Moreover, the results of data analysis reveal that there was a statistically significant difference in knowledge, experience, and perspectives scores between pre-service and in-service teachers. In addition, most teachers in this study preferred using portfolio as a tool of their professional development rather than to use it as an assessment tool while they attested to the fact that time and their abilities are two of the greatest limitations in implementing portfolio practice in the classroom.

Based on the findings of this study, two major suggestions are made to the field. Firstly, while the concept of portfolio assessment are still relatively new to both pre-service and in-service teachers, the teacher education programs should consider carefully to include theories and applications of portfolio assessment in the curriculum. Secondly, results of this study shown that most teachers in this study preferred using portfolio as a tool of their professional development rather than to use it as an assessment tool would convey an important message to the field of education and some further studies are required to explore further information.

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